

The OTB

THE OLD TIMER'S BULLETIN AUGUST 2003 VOL. 44 / #3

OFFICIAL JOURNAL OF
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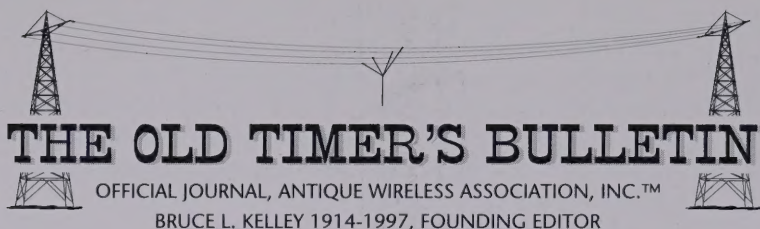
*Published for the collector,
historian and old-time
radio operator*



Photo courtesy Mike Katzdorn

Edwin Howard Armstrong
1890-1954 (SEE PAGE 46)

AWA CONFERENCE:
AUGUST 20-23, 2003
THEME: FREQUENCY MODULATION
SEE SPECIAL INSERT INSIDE



THE OLD TIMER'S BULLETIN

OFFICIAL JOURNAL, ANTIQUE WIRELESS ASSOCIATION, INC.™
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THE PRESIDENT'S MESSAGE

It is hard to believe that a year has passed since our last conference. It seems like it was only yesterday that we were all in Rochester. This year's conference should be a great one. We have all been very busy putting the seminars together and working out the schedule so everything will fit into the time allotted. Make plans to be there. This is one you do not want to miss.

AWA, Inc. had its spring board of directors meeting on May 3. The spring meeting is mainly a planning session for the annual conference and to make sure that we are on schedule for the year. Items that were discussed were the *AWA Review*, advertising budget, copyright projects, membership issues, and many other normal housekeeping items.

One of the most important topics was how to attract new members to the AWA. It seems that our membership is aging and is holding flat. We

need to attract younger members to keep the our organization active and healthy. If you know of a radio collector who is not a member, please make him or her aware of our organization. Our Web site (www.antiquewireless.org) has been designed to be an introduction to AWA. A printable membership application is available there, but if you would like to have several to hand out, just drop me a line.

As always if you have any questions or comments feel free to contact me, But please no calls after 9:30 p.m. (Eastern time), if possible.

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LETTERS TO THE EDITOR

All letters to the Editor are read with interest and attention, though not all can be published in this column. Letters may be paraphrased, shortened or otherwise edited to fit the available space. The statements made by our correspondents are their own opinions and do not necessarily reflect the views of either the OTB staff or the Antique Wireless Association.

NAME CORRECTION

In the May "Letters" column, there was a mistake in the heading "GROTE WEBER'S ACCOMPLISHMENTS." The name of this famous pioneering radio astronomer should have been spelled "Grote Reber."

3867 KHZ NET DENIZENS CONDUCT EYEBALL QSO

The AWA gang from the 3867 SSB net met on May 15 for lunch at Peddler's Village in scenic



The AWA gang from the 3867 kHz SSB net.

Bucks County PA. Members attending were: (front, l-r) K2TAE, Elwyn Erway; W3VVS, Paul Bohlander; W2DGB, Bill Fizette; K3BLC, John Butzer; visitor Gene Glidden, N3CNW; Paul Mooney, K4KRE; Norm Erway, WB2SYQ; Al Roehm, W2OBJ; Doug Crompton, WA3DSP. The net meets Monday, Wednesday and Friday mornings at 9:30 AM, on 3867 Khz. Anyone is welcome to join us! For more info:

DOUG CROMPTON, WA3DSP
1269 2nd St. Pike, Richboro, PA 18954
215-431-6307; doug@crompton.om

HISTORY SAN JOSE UNPACKS PERHAM COLLECTION

Long-time AWA member George Durfey (Portola Valley, CA), whose health problems have kept him from attending the Rochester Conference for the past few years, still keeps in regular touch with *The OTB*. Recently received was a clipping from George outlining the current status of the monumental Perham collection (see May letters). Curators at "History San Jose," a local museum that has taken over the collection, have

FROM THE EDITOR

Ironically, the same mail that recently brought me a short contribution from Alton ("Andy") Dubois also sadly included a newspaper clipping of his obituary—which was kindly forwarded by member Harry Goldman. You'll find Andy's last brief contribution in Ken Owens' "Equipment Restoration" column and an excerpt from his obituary in "Silent Keys."

Andy was an unusually prolific contributor to *The OTB*, always willing to share his adventures in restoration with our readers. In a recent issue of *Antique Radio Classified*, Editor John Terrey expressed similar sentiments about Andy's contributions to his own publication.

I finally had an opportunity to meet Andy at last year's Conference, when he spoke about casting replacements for pot metal parts at our "Moonlight Restorations" restoration forum. It is quite typical of Andy that, in the three or four

years since I've been hosting this seminar, he is the only member (outside of the few people who regularly work with me) who ever responded to my invitation to contribute a presentation.

On a related subject, If you've read Geoff Bourne's "President's Message" in this issue, you know how important he feels it is for AWA members to be proactive in introducing our organization to others. This brings me to the subject I've been dwelling on in my last two "From the Editor" columns. Yes, it's the AWA Message board recently added to our Web site by Web Page Coordinator Chuck Schwark. The Web site is now our most effective means of attracting new AWA members, and the message board is an enhancement added to improve the outreach of this important medium.

By helping to answer non-members' ques-
(continued on page 11)

been busy unpacking the some 20,000 objects which have been stored and inaccessible to the public since 1991. The unpacked artifacts will be warehoused while the museum negotiates to acquire the 35,000 square feet of gallery space needed to display them. In the meantime, a virtual gallery has been established at www.perham.org and will be expanded as the items are documented and catalogued. Thanks for the update, George!

DISTINGUISHED BROADCAST JOURNALIST WAS ALSO AVIATION PIONEER

I read the Fay Gillis Wells obituary (*OTB* May 2003) recounting her distinguished career in broadcast journalism which began in 1930. Earlier Fay had already launched another career. In 1929 she earned her pilot's license and later became a founding member of the "99s," an international organization of women pilots. She encouraged Amelia Earhart to become its first president. Of the original 99 members, Fay was one of only four who continued a lifetime dedication to flying.

In 1933 when Wiley Post made his around the world solo flight he turned to Fay Gillis to arrange his Soviet fuel stops. Fay's marriage in 1935 to Linton Wells (journalist and pilot) saved her life because she had planned to accompany Wiley Post on his fatal flight.

If space flight had been an option when Fay was young, she would most certainly have been

interested in becoming an astronaut. Instead she worked with NASA to help choose the first journalist to fly in a space shuttle. Fay's careers in journalism and aviation always intertwined.

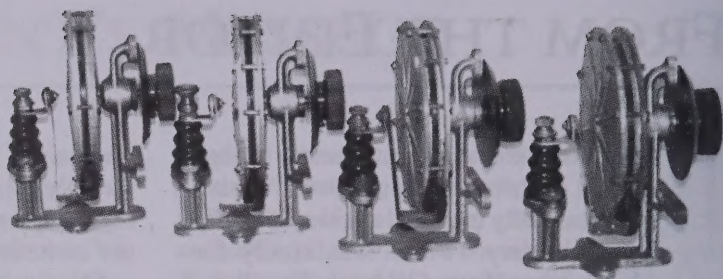
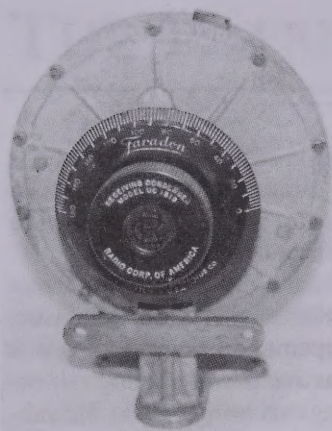
I'm not only a member of AWA but, like Fay, I'm a pilot with a longtime interest in the "99s" and women associated with aviation.

M. L. "HUTCH" FREDERICK, WW2A
Pittsford, NY

COMPLETE HAIKU DETAILS AVAILABLE FOR THE ASKING

My article "The Alexanderson Alternators at Haiku" (May *OTB*) seems to have stirred up considerable interest. I received many e-mails and letters requesting additional details. Since it was not possible to put the very lengthy original article, including details about the antenna construction, in *The OTB*, I would like to make it available to all members. You may obtain it by sending a request to josestephany@cs.com. In addition, one member notified me that a very rare history of ELF submarine communications is available from jmerrill@99main.com.

The most interesting letter I received was from a man who said "I don't believe it!" He thought it was a put-on. I guess Alexanderson Alternators are an unusual way of generating radio waves, but there was a helix room, the antennas were miles long, and the waves did go underwater. I assure everyone that I did not dream up the article and



Front view of UC1819 receiving capacitor and side view showing (from left) three UC1831 transmitting capacitors and the receiving capacitor. The former have red knobs; the latter black. Lettering on UC1819 knob identifies it as a "Faradon" made by RCA.

the photos were not faked. I actually was there. At least I think I was!

JOE STEPHANY N2XS

joestephany@cs.com

MORE INFO ABOUT HARRY'S MYSTERIOUS CAPS

I noticed Harry Mills' query about his Model 1831 Transmitting Condenser in the May "Letters" column. Enclosed are pictures of my own collection of these odd condensers. The units are partially filled with mercury, which is held on one side of a central dividing insulator. The knob rotates the entire circular case, which contains a fixed semicircular vane on the other side of the insulator. During rotation, the mercury stays on the bottom—but the vane moves around, changing its position with respect to the mercury and therefore the capacitance of the unit.

WALTER WORTH

2 W. Elm Ave., Quincy, MA 02170

Some of the information above is based on my own interpretation of Walter's letter and may not be entirely accurate. However, I'm including his full address so that interested readers may query him directly.—ed

MARCONI'S TRANSATLANTIC SIGNALS— A DIFFERENT INTERPRETATION

I enjoyed Henry Bradford's article "Did Marconi Receive Transatlantic Radio Signals in 1901" in the March and May issues of *The OTB*. As you know, I wrote a piece for the *AWA Review* on the same issue ("Marconi's Transatlantic Triumph," Volume 13, p. 81). In it, I hypothesized that Marconi did make it across the Atlantic on 820 kHz because, as I discovered, the sunspots for December 1901 were *exactly zero* and hence the D-layer absorption frequency was at its lowest. There's more in the article.

I was invited to the Marconi Centenary in Poldhu in Dec, 2001 and a fine time was had by all. I have pretty much convinced both the English and Swedish experts of my theory, but the Canadians seem to be holding out.

My next big project is to set up a test in about the year 2006 at a sunspot minimum on maybe 160 meters (1.8 MHz) between Poldhu and St. John's Newfoundland. The Poldhu Amateur Radio Club (Keith Matthew, Secretary) is interested. I'm thinking hash modulated SSB 2kHz bandwidth at 1.5 kilowatts PEP, MCW at the transmitter and several receivers.

The receivers would include a reconstructed Italian Navy coherer (I photographed Marconi's at the Science Museum in London last year) and a Galena detector. I would also try a sound-card DSP signal detector like SETI uses. I figure a tuned vertical antenna on each end peaked at 1.8 MHz, with short low loss coax, would make for a fair trial. It would be nice to get the UK Radio-communications Agency to give permission for 10 kW—that would be worth 8 dB in Newfoundland.

Like Marconi I don't trust expert opinion, in this case computer propagation programs. They are only as good as the models, and the models do not take sunspots or polar paths into account. There are published reports of 1990s medium wave transatlantic daylight reception in Newfoundland and that in the midst of the sunspot cycle. So much for the experts. Let's talk it up.

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415 399 9101 (home)

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FCC NIXES 132 KHZ HAM BAND

The ARRL petition for a formal amateur radio assignment at 132 kHz looked as if it were going
(continued on page 11)

AWA NEWS



OTB POLICY ON PROMOTING EVENTS: The OTB is pleased to list the meets and meetings of any established antique radio organization, whether or not it is associated with the AWA. Do not send your information directly to the OTB Editor. Please send it to Joyce Peckham, Box E, Breesport, NY 14816. Closing date is six weeks prior to first day of month of issue.

Calendar of AWA Activities

AUGUST 9

NFWA Amherst Meet

AUGUST 20-23

AWA Annual Conference

NOVEMBER 7-9

VRPS Convention

NOVEMBER 9

AWA, Inc. Membership and Board Meeting

NOVEMBER 9

AWA Museum Membership and Board Meeting

Calendar of Meets

(AWA logo identifies AWA-sponsored events)

ARCI RADIOFEST XXI

August 7-9

Presented by the Antique Radio Club of Illinois at the Elgin Best Western Hotel (formerly the Elgin Ramada Inn), 345 River Rd., Elgin, IL 60123. Theme: Chicago Radio Manufacturers. Large radio swap meet, contest, presentations, main and donation auctions, and much, much more. All sellers must be members of ARCI; no admission charge for non sellers. ARCI Membership: \$15.00; Selling Spaces: \$40.00 for the first; \$20.00 per additional. Special one-day single-space selling rates: Thursday only, \$30.00; Friday only, \$20.00; Saturday only, \$10.00. For more info: write ARCI at P.O. Box 1139, La Grange Park, IL 60526, e-mail ARCI at info@antique-radios.org, or visit <http://www.antique-radios.org/>

NIAGARA FRONTIER WIRELESS ASSOCIATION

August 9

Annual joint meet with the AWA. At the Amherst Museum, Amherst, NY (north of Buffalo). From the NY State Thruway, take Exit 49 (Transit Rd., Rt. 78) north nine miles. Left on Tonawonda Creek Rd. just before entering Niagara County (there is also a Tonawonda Creek Rd. in Niagara County on the north side of the Creek). Proceed two miles west to the museum. The meet is outside just west of the buildings. There are lots of motels and restaurants at



Thruway Exit 49. Flea Market 8 a.m. to noon. Museum exhibits open at 11:30 (there's a full room of early radios and TVs). Bring items for the auction beginning at about 11 a.m. There will also be a donation auction—but no junk we can't sell please! Contest categories: 1. Any battery radio; 2. Any AC-powered radio; 3. Any crystal radio; 4. Any speaker; 5. Open category—any radio-related item. Nominal entry fee includes annual NFWA membership, museum admission, flea-market setup. No additional fees to sell or for any other activity. Free coffee and donuts. Lunch available. For info, call Larry Babcock at (716) 741-3082 or Gary Parzy at (716) 668-2943.

AWA ANNUAL CONFERENCE

August 20-23

At Rochester Institute of Technology Conference Center (formerly Thruway Marriott). I-90 Exit 46 to I-390 North to NY253 West to NY 15 South. RIT info number: (585) 359-1800. Also see CONFERENCE PREVIEW section in this issue.



VINTAGE RADIO AND COMMUNICATIONS MUSEUM OF CT

2003 Swap Meet Schedule

All meets to be held at the Museum, located at 33 Mechanics St., Windsor, CT. Dates: September 13 (outdoors), December 6 (indoors). Contact: John Ellsworth, Museum Director, at radio-clctr@aol.com or (860) 673-0518.

VRPS CONVENTION

November 7-9

29th annual convention of the Vintage Radio and Phonograph Society. The host hotel is the Hampton Inn and Suites located at 1700 Rodeo Drive, Mesquite, Texas 75149. Contracted rate of \$69. Reservations via 1-800-HAMPTON. Events include four auctions, flea market, contest, seminar and banquet. For more info as it becomes available visit the VRPS Web page at <http://www.gbronline.com/radioguy/vrpsinfo.htm>



AWA, INC MEMBERSHIP AND BOARD MEETING

November 9

At RIT Conference Center (see above). Mem-



bership meeting at 11 a.m. All members welcome. Board meeting follows.

AWA MUSEUM MEMBERSHIP AND BOARD MEETING

November 9

Same location as above. Membership meeting (all members welcome), followed by Board meeting, begins at conclusion of AWA, Inc board meeting.

Recurring Meetings & Events

- Antique Radio Collectors of Ohio—meets first Tuesday of each month at 2929 Hazelwood Ave., Dayton, OH (4 blocks east of Shroyer Rd. off Dorothy Lane) at 7 p.m. Also annual swap meet and show. Membership: \$10.00 per year. For more info, contact Karl Koogle: mail to above address; phone (937) 294-8960; e-mail karlkrad@gemair.com

- California Historical Radio Society—For info on current meetings, call the CHRS hotline: (415) 821-9800.

- CARS, the Cincinnati Antique Radio Society—Meets on the third Wednesday of each month at ITT Technical Institute, 4750 Wesley Ave., Norwood (Cincinnati) Ohio. For more information contact Greg Tierney, (513) 732-1844, or Bob Sands, (513) 858-1755.

- Carolinas Chapter of the AWA—Hosts four “mini-swap-meets” each year (in January, May, July and October) plus an annual conference, “Spring Meet in the Carolinas,” on the 4th weekend in March. Executive committee meets approximately quarterly. For more info, visit the Web site at CC-AWA.ORG or contact Ron Lawrence, KC4YOY, Chapter President, P.O. Box 3015, Matthews, NC 28106-3015; phone (704) 289-1166; e-mail kc4yoy@trellis.net

- Central Ohio Antique Radio Assn.—Meets at 7:30 p.m., third Wednesday of each month at Devry Institute of Technology, 1350 Alum Creek Rd., Columbus. (1-70 Exit 103B). Contact: Barry Gould (614) 777-8534.

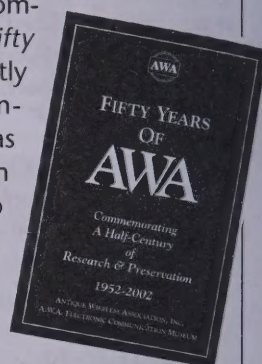
- Cincinnati Antique Radio Society—Meets at 7:30 p.m., third Wednesday of each month, at Great Oaks Institute, Scarlet Oaks Campus, 3254 E. Kemper Rd., Sharonville, OH 45241. For info and directions, call Tina Hauke at (513) 771-8840.

- Delaware Valley Historic Radio Club—Meeting and auction begins 7:30 p.m. on the second Tuesday of each month. Location: Telford Community Center on Hamlin Ave. in Telford, PA. Annual dues: \$15.00, which includes a subscription to the club’s monthly newsletter *The*



50th Anniversary Commemorative Booklet

Our 50th anniversary commemorative booklet *Fifty Years of AWA* was recently mailed out to all members. The publication has received high marks from almost everyone who has seen it. We still have a stock of this profusely-illustrated 60-page AWA history available



for those who would like extra copies or those who were not members at the time of distribution and didn’t receive one. Cost is \$7.00 per copy postpaid, no limit. But once they’re gone they’re gone—so act now if you are interested! Send your check to Joyce Peckham, Box E, Breesport, NY 14816.

Oscillator. For more info contact Delaware Valley Historic Radio Club, PO Box 5053, New Britain, PA 18901. Phone (215) 345-4248.

- The Downer’s Grove (IL) Park District Museum sponsors a monthly “Collector’s Hour.” Participants have the opportunity to display collections at the facility for several weeks before making their individual presentations. The event is open to the public with no admission charge. The museum has also begun to sponsor a yearly “Collector’s Fair.” For more info, contact Mark Harmon, The Downer’s Grove Park District Museum, 831 Maple Ave., Downer’s Grove, IL, 630-963-1309, fax 630-963-0496, mharmon@xnet.com.

- Houston Vintage Radio Association—Meets second Tuesday each month (except Jan. and Dec.) at Lai Lai Restaurant, Tides II Motel, Houston Medical Center, Main and Holcombe Sts., Houston, TX. Meetings include auction/program, 7-10 p.m. Assoc. publishes *Grid Leak* quarterly, monthly activity announcements. Membership \$15/yr. Write: HVRA, P.O. Box 31276, Houston, TX 77231-1276, or call Richard Collins, (713) 778-0721.

- Hudson Valley Antique Radio & Phono Society—Meets third Thursday of month, 7 p.m. Meeting, swap meet, and membership info: Peter DeAngelo, President, HARPS, 25 Co. Rt. 51, Campbell Hall, NY 10916. (914) 496-5130.

- Indiana Historical Radio Society—Meets quarterly in Feb., May, Aug. or Sept. and Oct. Flea market and Old Equipment Contest at all

With the Chapters

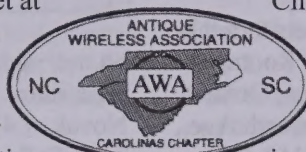
CC-AWA CHAPTER NEWS

Hello from the Carolinas. Things are moving kinda slow around here, what with the summer heat that followed weeks and weeks of rain. I was wondering if we needed to start thinking about building a really big boat.

The CC-AWA Spring Swap Meet at the North Carolina Transportation Museum (Spencer Shops) was another success. There were 25-30 vendors set up on a perfect-weather Saturday morning. We've been getting together at Spencer for 7 or 8 years now and we've never had bad weather.

If you've never attended, it's worth a visit. The swap meet is in the picnic area which has three shelters with lots of tables and plenty of parking room. The museum has lots of neat trains, cars, trucks and airplanes as well as one of the few working steam powered roundhouses in the country and a work shop where they rebuild steam locomotives—very impressive.

During the swap meet I had time to meet with the members of our newsletter committee to discuss some of the layout issues and format suggestions for this reinstated publication. Judy and Barker Edwards, Laura Carter and Lilburne



Sheets are doing a great job on *The Carolina Antenna*, as it will be called. After things wrapped up at the meet, about ten of us drove up to Lexington NC to "Lexington BBQ" for lunch. It's VERY good.

Anyone who was a registered attendee of the Charlotte Conference will receive a copy of the first issue, which contains a detailed conference wrapup. I've seen a preview of it and it looks GREAT. If should be in your hands early in July.

The next event on the CC-AWA calendar is our Summer Swap Meet that will take place on Saturday, July 26th, in Valdese NC. I will have a full report on this event in the next installment of CC-AWA Chapter News in November, 2003 *OTB*.

If you'd like to receive the "new" CC-AWA newsletter, "The Carolina Antenna," membership in the chapter is only \$10, which includes the newsletter and FREE registration for the CC-AWA Annual Conference in Charlotte. Membership information can be found on the CC-AWA Web page at CC-AWA.ORG. 73 & Happy Collecting from the Carolinas.

— Ron Lawrence, KC4YOY

events. Auctions at all but Feb. meet. The *IHRS Bulletin* has been published quarterly for the past 32 years. For meet details and information about the club and our Indiana Historic Radio Museum in Ligonier, IN see our Web site at www.indianahistoricalradio.org or contact Herman Gross, W9ITT, 1705 Gordon Dr., Kokomo, IN 46902-5977, (765) 459-8308, w9itt@mindspring.com

•London Vintage Radio Club—This Ontario, Canada club meets in London on the first Saturday of January, March, May, June and November. Annual flea market held in Guelph, Ontario in September in conjunction with the Toronto club. Contact: Lloyd Swackhammer, VE3IIA, RR#2, Alma, Ontario, Canada N0B1A0. (519) 638-2827. E-mail contact is Nathan Luo at lvrceeditor@yahoo.com.

•Mid-Atlantic Radio Club—Meets monthly, usually the third Sunday of the month at the New Hope Seventh Day Adventist Church, Burtonsville, MD. Contacts: President, Geoff Shearer, 14408 Brookmere Dr., Centreville, VA 20120, e-mail gshea90278@aol.com; Membership Chair, Paul Farmer, (540) 987-8759, e-mail: oldradiotime@hotmail.com. Web site www.maarc.org

[maarc.org](http://www.maarc.org)

•New Jersey Antique Radio Club—Meets second Friday each month, 7:30 p.m. Holds three annual swap meets. Contact (send SASE) Phil Vourtsis, 13 Cornell Pl., Manalapan, NJ 07726, (732) 446-2427.

•Northland Antique Radio Club—hosts four events with swap meets each year (in February, May, September and November) including an annual conference, "Radio Daze," for two days in mid-May. Annual dues are \$12.00, which includes a subscription to the club's quarterly newsletter. For more info, visit our Web site at www.geocities.com/northland.geo/; contact Ed Ripley at (651) 457-0085; or write NARC, P.O. Box 18362, Minneapolis, MN 55418.

•Northwest Vintage Radio Society—Meets second Saturday of each month (except July and August), at or about 10 a.m., at Abemathy Grange Hall, 15745 S. Harley Ave., Oregon City, OR. Members display radios, exchange information. Guests welcome at all meetings and functions, except board meetings. For info, write the Society at P.O. Box 82379, Portland, Oregon 97282-0379.

•Oklahoma Vintage Radio Collectors—Okla-

homa City Chapter meets second Saturday each month at Hometown Buffet, 3900 N.W. 63rd St., Oklahoma City, OK. Visitors welcome. Dinner/socializing, 6 p.m.; meeting at 7 p.m. Membership, \$12/yr., includes monthly *Broadcast News*. Info: SASE to OKVRC, P.O. Box 50625, Midwest City, OK 73140-5625; or contact Fred Karner at (405) 769-4656 or fkarnet@cox.net; or visit our Web site at <http://members.cox.net/okvrc/>.

•Ottawa Vintage Radio Club—Meets monthly (except June and July) in Conference Room, *Ottawa Citizen*, 1101 Baxter Rd., Ottawa, Ontario. Contact: Tom Devey, 601-810 Edgeworth Ave., Ottawa, ON K2B 5L5, (613) 828-5152. Membership: \$10 Canadian/yr.

•Pittsburgh Antique Radio Society welcomes visitors to our Saturday flea market/contests in March, June, September, and December. An auction is included in September, and our annual luncheon/program is held the first Saturday in December. Our newsletter, *The Pittsburgh Oscillator*, is published quarterly. Website: www.nb.net/~schaefer/pars.html

AWA Life Memberships Are Now Available



Cost: \$400 (U.S.), \$500 (elsewhere)

Send your check to AWA Secretary Joyce Peckham, Box E, Breesport, NY 14816.

Phone (607) 739-5443.

E-mail: awaapeckham@aol.com.

For directions, specific dates, information call President Bonnie Novak at 412-481-1563 or write to Karl Laurin, 8111 Sally, White Oak, PA 15131.

•Society for Preservation of Antique Radio Knowledge—Meets at 7:30 p.m. the second and fourth Tuesdays of each month in the party room at Cassano's Pizza Parlor, 1700 East Stroop Rd., Kettering, OH. Membership, \$18/year. Write SPARK Inc, P.O. Box 292111, Kettering, OH 45429; e-mail sparkinc@juno.com or call John Pansing at (937) 299-9570.

•Texas Antique Radio Club—Meets alternate months in Kyle and Shertz, TX. Contact: Ron Manning, President TARC, 133 East Huisache Ave., San Antonio, TX 78212. Phone (210) 734-6831; e-mail ronmeg@gateway.net; Web site www.gvtc.com/~edengel/TARC.htm

AWA Nets

(EASTERN TIME)

PHONE

SUNDAY:

7244 kHz, SSB, noon (NCS:WA4IAM);

3837 kHz, AM 4:30 p.m.

NCSs:W2ZM & W2AN)

TUESDAY:

14274 kHz, SSB, 2:30 p.m. (NCSs: KC3YE and W0FX)

3837 kHz SSB, 8 p.m. (NCS: WB2SYQ)

MONDAY-WEDNESDAY-FRIDAY:

The AWA Bruce Kelley HF Net

3867 kHz, SSB, 9:30 a.m. (NCS: W2OBJ)

CW

DAILY, 4 p.m., 3588 or 7050 kHz. Protocol, informal. Check both frequencies for activity and join in, or call AWA de (your call) and see what you stir up. First

WEDNESDAY of each month, 8 p.m., 7050 kHz

2-M REPEATER (Rochester Area)

MONDAY, 7:30 p.m. (NCS: K2GBR)

Receive 145.290 MHz

Transmit 144.690 MHz

Service Sources Available

The AWA Source Sheet is a listing of parts suppliers and services for the radio collector. Cost: only a business-size self-addressed stamped envelope to AWA, Box E, Breesport, NY 14816.

AWA Slide/Video Program

The Antique Wireless Association has available several historical documentaries to loan to affiliated organizations for club meetings and programs. There is no charge for this service other than return mailing cost. For info on loan conditions, to make reservations, or just inquire, contact Ed Gable, Curator, AWA Electronic Communication Museum, 187 Lighthouse Rd., Hilton, NY 14468. The following are available:

VHS VIDEO PROGRAMS

V-2 — "Electrons on Parade." 18 min. 1938 movie made at RCA's Harrison Plant showing production lines with closeups showing receiving tubes, including a short sequence on transmitting tubes. (Very rare movie.)

V-4 — "The British Receiver." Documentary

of the AWA/BVPS meet with visit to Marconi's Chelmsford plant, the British Science Museum, and ending with series of collectible British receivers. (VHS program transferred from slides.)

V-5 — "The Early Years." Historical documentary narrated by Clarence Tuska telling of the early years of amateur radio, founding of the ARRL and WW I military radio training school. (VHS program transferred from slides.)

V-6 — "The Key." History of the telegraph/radio key covering early hand keys, semi-automatics and commercial types. Script by Lou Moreau, W3WRE. (VHS program transferred from slides.)

V-9 — "The Transatlantic Tests and IBCG." Rare documentary/photographs showing early amateur operation leading to famous 1921 transatlantic tests.

V-12 — "Those Wonderful Magazine Covers." The story of radio through magazine covers. Colorful with period music.

V-15 — "The WHAM Story." Details development of a pioneer radio station in Rochester, NY. Program developed with assistance and rec-

ollections of Art Kelly, the station's former general manager.

V-16 — "The Charles Herrold Story." Video prepared by Mike Adams who donated this copy to the AWA. It documents the work of broadcasting's Forgotten Father who started broadcasting in 1912.

SLIDE PROGRAMS

S-1 — "Portrait of a Pioneer." The life of Elmo Pickerill.

S-2 — "Polar Adventure." Pictures taken by Bud Waite and his narration describing numerous trips to the Antarctic over a 35-year period.

S-3 — "70 Years of Vacuum Tubes." Describes the history of vacuum tubes.

S-4 — "The Early Years." (See description for V-5.)

S-7 — "The Transatlantic Tests and IBCG." (See description for V-9.)

S-8 — "Trip Through the AWA Museum" Covers exhibits and equipment.

S-12 — "The Key." (See description for V-6.)



FROM THE EDITOR, continued from page 5

tions, or even letting them answer yours, you are setting up a dialogue that can easily lead to new join-ups. I realize that this is a new service and will take awhile to really get established, but participation is really surprisingly small. I just visited the site and noticed that the last three or four queries have so far been ignored—even one where a person only wanted a little background

on the ins and outs of Conference attendance.

Such a lack of response is obviously very bad PR for us and can certainly do AWA more harm than good. Surely our 3500-plus membership, many of whom have internet capability, can make a better showing than this! Anybody have ideas about how we can increase member participation on the message board?



LETTERS, continued from page 6

to be approved, but the FCC surprised everyone by denying it. The reason: possible interference with signals used in connection with the operation of the national electricity grid. To read the complete story, visit the following Web sites:

<http://www.lwca.org/miscdocs/FCC-03-105A.txt>

<http://www.arl.org/news/stories/2003/05/14/100/?n=1>

http://hraunfoss.fcc.gov/edocs_public/attachmatch/

FCC-03-105A1.doc

FRANK J. LOTITO K3DZ

Pittsburgh, PA

LIGHTBULB COLLECTION IS MOVING TO MUSEUM

I just came across the following news item.

You might like to include it in *The OTB*. Many of our members are light bulb collectors.

BALTIMORE (AP) — Dr. Hugh Hicks' bright idea is becoming a tourist attraction. The Baltimore dentist collected about 50,000 light bulbs, and had many on display in the basement of his office. After Hicks' death, his family had to decide what to do with all those bulbs. The collection is now moving to the Baltimore Museum of Industry.

Hicks had everything from some of the first Thomas Edison bulbs to the world's tiniest bulb, which was made for NASA. But Hicks' pride and joy was a giant 50,000 watt light bulb, built on the 50th anniversary of Edison's invention.

JOYCE PECKHAM, Secretary, AWA

Breesport, NY



MUSEUM NEWS

Visit us on the Internet at <http://www.antiquewireless.org>

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MUSEUM CONTACT

For all inquiries about the Museum and its operation, contact Edward M. Gable, Curator, 187 Lighthouse Rd., Hilton, NY 14468. Phone: (585) 392-3088, e-mail: k2mp@eznet.net.

The AWA. Electronic Communication Museum is an IRS 501(c)3 charitable organization.

**also on AWA Inc. Board of Directors*

From the Curator

‘Hello from your museum crew’ should be a familiar greeting by now... and here’s the news. The museum is off to a great start this year with higher than ever attendance sparked by increased advertising. Sure, we send news releases to all the local papers and they kindly give us an article or two, but now we also have paid advertising, which seems to be working well, in a Finger Lakes tourist magazine. Also new at the museum is a tribute to those participating in the Museum’s Adopt-a-Radio program. Work of the “adopter” is on display with proper credit.

Briefly, the Adopt a Radio activity enables members to participate in our museum program by “adopting” a radio to take home from the Conference, fixing it up, and returning it the following year. Details on how to participate and help your museum can be had by contacting the program leader, Allan Pellnat, KX2H, at kx2h@worldnet.att.net. Alan’s report on the program appears elsewhere in this column.

The Spring Meet was a great event with good weather, a nice flea market and the usual fun auctions and tag sales of Annex

excess. Yours truly came up with a bad sore throat and was unable to do the customary auctioneer chanting. To the rescue came retired AWA President Bill Fizette, W2DGB, who did a wonderful job of moving the stuff to new owners. For more on the meet, see Bob Roberts’ report elsewhere in this column.

Brand new to the museum selection of tools is a high power vacuum tube tester similar to that in *The OTB*, volume 42, #3, (Aug. 2001) written by

Richard Parks. Stepping out of his normal Librarian duties to build the device was Doc Ely (MD). He made it wonderfully functional, but also classic in style with polished brass fittings and transformer cases. A real touch of class. Tom and others have now been testing tubes like crazy and we’ll have a selection of excess items for sale at the conference....fully tested and a safe buy from your museum crew.

Spring in Rochester also brought ice storms with downed trees, power lines and inevitably, antennas. W2AN’s big loop was a victim but our ex-telephone guy and now ham equipment manager, Ron Walker, WA2TT, came to the



Tom Ely checks a 304TL with his “Really Big Tube tester.”

rescue. He still climbs up those poles like a teenager. The problem? An 80-year-old glass insulator finally failed.

Thanks to many of you who continue to support your museum with nice donations. I am also very pleased by the continuing support of Rochester's Harris Corporation, which recently donated one of the first synthesized HF, 100 watt class SSB transceivers to come on the market (their model RF-301). Another Rochester firm, WROC-TV, donated their just-taken-out-of-service RCA color Studio camera (model TK-43). This goes nicely with another WROC-TV camera, the 1949 B&W job, now shown at the museum entrance.

I need to mention the new facility activity briefly. We have just completed soil percolation testing on our current property adjacent to the AWA Annex as one phase of determining its suitability as a site for an expanded museum. It would appear that an above-ground septic system would be required and a deep well test is in process now to determine the severity of the

problem and the costs.

Plans for the Annual AWA Conference sound great so far. We'll be looking forward to having you visit the Annex and Museum on Wednesday night! S'long for now.

Ed Gable

ED GABLE, K2MP/W2AN
Museum Curator

Report From The Spring Meet Chairman

The 2003 Spring Meet is now history. On behalf of the entire museum staff, I would like to thank all those who attended for the participation and support that made this year's Meet an immense success.

This year's meet offered demonstrations of vintage television and record-cutting equipment as a preview of a new museum exhibit. Mike Csontos, John Atwood, and Jack Wenrich

RECENT MUSEUM DONORS

- ❖ Ralph Williams Estate.....*Early HRO, SW-3s, nice Homebrew RX*
- ❖ Chris Fandt.....*US Army in WW2, 3 book set*
- ❖ George Pierce*AC SW-3*
- ❖ Tom Rosica W2GIR.....*Several am/fm sets, Bogen 50W Amp*
- ❖ John Zima.....*Collins 51J3/R-388*
- ❖ Virginia Hartley.....*Zenith A385E*
- ❖ Carol Murzin*RCA RZD311*
- ❖ Mike Raide W2ZE*James Millen 9093 oscilloscope*
- ❖ Robert Roberts WA2QAU*Studio grade turntable*
- ❖ Elmer Wagner W2BNJ*RCA Direct TV 12 GHz system*
- ❖ William Hopkins AA2YV*Hallicrafters SX-71, Eico 720*
- ❖ Harris Corporation/RF Div ...*Early RF-301 HF SSB Xcvr. RF-805 Amplifier*
- ❖ WROC TV Rochester.....*RCA Color TV Studio Camera TV-45*
- ❖ Stan Rubin N2GLA*DX-100, Kenwood 2 mtr FM, more...*

Cash Donations:

- ❖ Harry Sadler VE1CDT

worked for months to restore the disk-cutting equipment to operational condition. Also returning by popular demand was the equipment auction—with this year's guest auctioneer Bill Fizette, W2DGB.

The Annex sale and auction was hugely successful; over fifteen hundred dollars was raised for the Museum. Highlights of the auction were a vintage British audio amp and a complete set of Rider's manuals.

The Spring Meet is an important source of revenue for the Museum's operating costs. In an effort to provide a strong financial base for the future, we plan to expand the Spring Meet over the next several years to make it a bigger and better event.

Changes under consideration include pre-registering vendors to allow for advance site planning and layout as well as opening the meet to the general public on a paid admission basis. This last would provide additional potential customers for the sellers as well as a pool of possible new members. Other possibilities include offering a verbal radio appraisal for a small fee, as is done at antique shows, and soliciting the participation of commercial vendors of restoration supplies and services.

The meet committee would also like to hear suggestions and comments from the members. Please contact Bob Roberts, WA2QAU, Spring Meet Chairman, at (585) 538-9555 or rrobert4@rochester.rr.com with your thoughts.

Report From the Adopt-A-Radio Program Manager

The museum's Adopt-A-Radio program began two years ago at the fall conference. Six radios were offered for adoption to qualified restorers during the museum annex open house on Wednesday evening.

Three of those sets were adopted for a period of one year by three members. Each adoption

agreement outlined what could or could not be done to accomplish the restoration. For example; whether or not to refinish the cabinet or allow substitution of modern parts. At last year's conference all three of those sets were returned fully restored to operational and museum display quality appearance.

The restorers and their sets were: Robert MacIntyre, of Manitoba, Canada (King Model 30 battery-operated three-dial TRF c1925). J. Fred Crews, of West Virginia (RCA Radiola 20 battery operated Superhet c1925). Allan Pellnat, of New York State (Bremer-Tully Counterphase Six kit built battery operated 2 dial TRF c1925).

Bob MacIntyre's King Model 30 was displayed in the AWA booth at the 2003 Rochester Hamfest. The same three members adopted new sets (Bob and Fred each adopted two!) after returning the above and two of those have already been completed and returned. J.Fred Crews did a nice job of bringing a 1933 Majestic Model 49-B art deco table top set back to life. It is now on display in the museum along with his Radiola 20 from the previous year. Allan Pellnat adopted a National SW-54 communications receiver that really only required a cosmetic cleanup before being returned.

Fred is still working on a late thirties Silver-tone three-band superhet. From the looks of the "before" picture in my file, he has a lot of work to do on this one. Bob's projects are a one-tube Michigan Radio Corp. regen and an Akradyne three-dial battery TRF.

I look forward to being pleasantly amazed when the sets still in work are returned at this year's conference. If you see any of these restorers at the conference say hello and thank them for a wonderful service to our community and our museum.

ALLAN PELLNAT
*Deputy Director AWAECM
Adopt-A-Radio Program Manager*



ADDITIONAL LODGING AT THE CONFERENCE

While the RIT Conference Center is clearly the most convenient location, other accommodations are available in the immediate area. Among the possibilities are:

Country Inn and Suites: 585/486-9000

Days Inn: 585/334-9300

Fairfield Inn: 585/334-3350

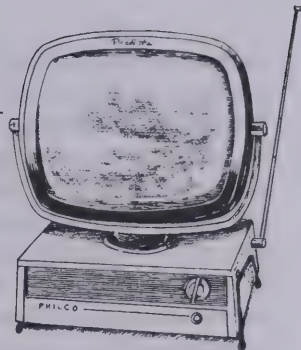
Microtel: 585/334-3400

Red Roof Inn: 585/359-1100

Super 8: 585/359-1630

TELEVISION

EDITED BY **RICHARD BREWSTER**, 145 LITTLE PECONIC BAY ROAD,
CUTCHOGUE, NY 11935 PLEASE INCLUDE SASE FOR REPLY.



Early Chicago Television

The following paper was written by William N. Parker in 1984 and was published by Peter Yanczer in the July 2000 issue of Electric Pictures Quarterly. It has been edited for this column. Peter is President of The Experimental Television Society; Bill was Chief Engineer, Transmitters, Western Television Co. We are indebted to Peter for his efforts in locating and preserving this important document covering Bill's recollection of his personal experiences in the development of early television. See the TV Column of the February, 2001 issue of The OTB, for article about educational tv in the 30s that ties in with his work.—rb

In the summer of 1984 I came across the obituary of Marcella Lally, who regularly performed on Chicago television during 1930 and 1931. This sparked my interest in recording my own early experiences with mechanical television.

Television experiments began in Chicago in October of 1925, four months after Francis Jenkins demonstrated televised silhouettes in the Washington DC area. Nineteen year old Ulysses Sanabria, with [financial?] help from William Randolph Hurst, had set up a laboratory in the Hurst building in downtown Chicago.

It seems that in a forward to an album of his songs, Sanabria wrote "Stories about John Baird preceding either Jenkins or myself are incorrect as to date for we have abundant proof to the contrary. Both Jenkins and myself developed television independently and television is truly an American invention and do not let anyone ever tell you that the Europeans ought to share in the credit."

I had the good fortune to witness Sanabria's work in June of 1926. The images were in silhouette and blurred, and it was barely possible to distinguish between the image of a person's hand and that of a wrench. I had then just completed my sophomore year at University of Illinois in Urbana, studying electrical engineering, and was working part time for the GM Scientific Co., a small enterprise run by two graduate students, A.J. McMaster and Lloyd P. Garner. The company

supplied photoelectric cells and other devices to experimenters such as Sanabria and Dr. Lee DeForest. I spent the summer of 1927 at the General Electric Co. in Schenectady, NY., which gave me the chance to make occasional visits to Dr. Alexanderson's laboratory, where Ray D. Kell and others were experimenting with television. They demonstrated for the press a mechanical system using a disc having a spiral of 24 holes.

A plate-type neon lamp was behind the disc and the picture was about an inch square. The half tones of the faces were quite good. GE also had a short wave transmitter which they sometimes used to broadcast television pictures. Later the following year, I was in Schenectady when Kell was experimenting with Kodak lenticular lenses for color television.

My next contact with Chicago television came in the spring of 1928, when a quick trip was made to Sanabria's laboratory to borrow a pair of synchronous motors for use in the demonstration of television at the University of Illinois biannual Electrical Engineering Show. Under my direction, as EE Society President, students had worked during the year to build an amplifier and a pair of cardboard scanning discs. The synchronous motors would cause the discs to rotate in step.

But the day before the show was to open, the motors which we had ordered had not arrived! Sanabria had his motors built into his scanners with perforated leather belts driving the discs at 900 rpm. He told me to take the complete units for the duration of the show. I drove back to Urbana in the rain, arriving at our laboratory at daybreak, where the other students had been working all night. The television demonstration was ready when the show opened later that day!

The general public was extremely interested in the display and hundreds of people waited in line to enjoy watching their friends in the little receiver as they posed before the flying spot transmitting scanner. Typical "entertainment" consisted of winking each eye or using a handkerchief. This was very likely the first time that

most of the visitors had been able to witness such a demonstration.

A vital part of the television system was the bank of four large photoelectric cells that picked up the light reflected from the flying spot on the subject's face. These cells were made by Lloyd Garner at night when no one else was in the physics lab. A crucial step in the processing of the cells consisted of heating the "window" of an evacuated 22 liter glass flask while cooling the remainder of the flask with ice water! Adding to the danger was the fact that inside the flask was a handful of potassium metal—quite explosive if exposed to water! After the show, some of the cells were sold to television experimenters in the Boston area. [Possibly one of them was Hollis Baird who was beginning his work at this time.]

In Chicago that summer (1928) Sanabria was working with radio station WCFL, experimentally sending his television signals out over the broadcast channel. He invited me to witness the operation, located at the end of Navy Pier. The television images were quite good, having excellent half-tones and good definition.

During the summer, after graduation from the University of Illinois and going to work for Stewart Warner, I constructed a shortwave receiver and scanner which we used to receive television pictures broadcast by Jenkins from Washington D.C. Although it was difficult to obtain synchronization, we could recognize someone bouncing a ball and other silhouettes.

Meanwhile, Sanabria had teamed up with Clem F. Wade to form a new television laboratory for developing a receiver to show stock market reports. They convinced me to join them in Louisville, where the new laboratory was to be located in one of the U. S. Foil Co. buildings (where aluminum foil wrappers were made for Eskimo Pies). Wade had started the Eskimo Pie Corp. and U. S. Foil belonged to Reynolds Metal Co., owned by R. S. Reynolds.

Photo cells, special scanners and other equipment was assembled and taken to New York for a demonstration for Reynolds. The demonstration was such a success that Western Union heard about the new way of broadcasting stock market reports and promptly put a stop to the development. Plans were then made to move the laboratory to Chicago to broadcast television for educational and entertainment purposes.

I arrived in Chicago about the middle of May with my first assignment; that of modifying Crosley three-dial, metal box, trf receivers for operation at 2100 kc. The 171 output tube passed sufficient current to operate a plate-type neon lamp. Sanabria was already building the

W9XAO television transmitter at 6312 Broadway, where the WIBO studios were located.

Initially, a small television studio was built near the main WIBO studio on the second floor. A bank of photocells was mounted in the wall of the studio with a hole in the middle for the entrance of the flying spot scanning beam. The light source was a Peerless reflector arc lamp such as was used in movie houses.

The scanning disc had 45 tiny holes arranged in three interlaced spirals, and was mounted directly on the shaft of a 900 rpm synchronous motor so as to scan at 15 frames a second. A similar interlacing scheme was later used in electronic tv to allow slower scanning without flicker. A projection lens in front of the disc magnified the approximately one inch square field at the disc to about two feet square at the location of the performer in the studio. Lenses of different focal lengths could be used to produce scan fields up to 10 feet square.

As the flying spot moved rapidly across the performer, light was reflected back to the photo cells and converted into corresponding electrical signals. A row of automobile storage batteries was connected across the dc supply for the arc lamp to smooth out fluctuations at the light source. The transmitter, located on the top floor, consisted of a pair of UV204, 250 watt tubes as oscillators, which were isolated from electrical ground. The antenna was on the roof.

An unusual modulation scheme known as "series modulation" consisted of several UV204 tubes connected in parallel. Their cathodes were at ground potential and their anodes were connected to the cathodes of the oscillator tubes. A motor generator supplied the necessary 2000 vdc.

Experimental television broadcasts from this small studio were mostly head-and-shoulders shots. Some of the programs used the audio channel of WIBO. Several movie stars posed including Don Ameche. The number of television receivers was very limited.

We were now operating as Western Television Corp. with Clem F. Wade as President and Martin J. Wade as Secretary. (I still have several thousand dollars in stock issued to me in lieu of salary.) In the fall of 1929, the televising equipment was moved to the main WIBO studio for more regular broadcasting. Larger scanning fields were tried here, such as for a boxing match and a golf lesson.

One of my early jobs was finding a supplier of 900-rpm synchronous motors. We received samples from GE, Holtzer Cabot, and Emerson with the best price of \$11 per motor, in lots of 1000, from GE. This meant a projected price of the

complete receiver would be \$250.

Manufacturing was started by the Hedman Mfg. Co. in Chicago. My assignment in the fall of 1929 was to design and build the television equipment for use at W9XAP, the companion station for the *Chicago Daily News* station, WMAQ. It was to be located on the 25th floor of the *Chicago Daily News* Building, on 400 West Madison St. Multiple cameras were to be used to facilitate the instantaneous scene changes required for smooth programming.

Two flying-spot scanners were provided, each with a turret of four projection lenses and a steerable surface-reflecting mirror to properly position the scanned field. The low scanner was used for seated persons seated behind a bank of photo-cells built into the wall. The other scanner projected its beam at eye height into the studio. The light sources for the scanners were 30 volt, 30 amp incandescent projection lamps.

Light pickup for the long shots was by means of two large photo-cells suspended from ceiling tracks on either side of the studio. Each one had a separate preamplifier and cable to the main amplifier rack adjacent to the scanners. The main amplifier boosted the picture signal and sent it over a special low capacitance cable to the W9XAP transmitter over 100 feet away. A viewing monitor mounted in the rack permitted convenient checking of the picture. Switching between pickups employed relays, pushbuttons and signal lamps. A special feature automatically blanked out the picture briefly during lens turret operation.

The W9XAP transmitter was designed like a commercial broadcast transmitter with a temperature-controlled quartz crystal to maintain the 2150 kc carrier. Several RF buffer stages amplified the carrier to drive a 1 kW water-cooled output tube. A similar tube was used as a series modulator, but this was later changed to a system using a linear amplifier after the modulator.

A large storage battery on an insulated platform supplied the RF output tube filament. The 4000 Vdc supply consisted of two double commutator generators connected in series and mounted on either side of a large dc motor. The antenna was strung between the two flag poles on the roof of the building, just above the transmitter room.

The first official telecast of W9XAP was on August 27, 1930. Receivers were distributed to stores in the Chicago area, including Sears Roebuck. Large crowds assembled to see and hear WMAQ artists perform. The signal was strong but the "ghost images" caused disappointment. It seems that ionized layers 50 to 100 miles up caused the delayed signals, resulting in ghosts. Later, images from W9XAP were received up to

400 miles away.

One interesting sight-only program consisted of election returns on the evening of November 4, 1930. Television programs from W9XAO were regular enough to be listed in the *Daily News*. In fact, here was a two column photo of Marcella Lally in front of the photo cell bank in the May 7, 1930 issue. She may have been the first TV performer to be seen and heard simultaneously. The play, "The Maker of Dreams," was broadcast on the evening of January 7, 1931, possibly the first sight and sound dramatization broadcast [On September 11, 1938, GE broadcast "The Queen's Messenger," but it did not include sound].

The transmission of fingerprints for the police commissioner was also considered a success. Even ticker-tape stock quotations, delayed 15 minutes were broadcast. Several programs consisting of cartoons drawn on tape were pulled past the scanner.

At the Western Television Laboratory, a search was on for a cheaper motor that could drive a disc with lenses. Finally, Barber Coleman was able to supply one for about a dollar! Since the synchronous speed of this motor was 1200 rpm, a pair of gears was used to reduce the speed to the required 900 rpm.

A slip clutch and helical spring arrangement was employed to enable the high-inertia lens disc to come up to speed. The spring connected two conical sleeves so as to allow slippage only in the rotational direction which tended to unwind it. A small friction disc prevented undesirable torsional oscillations in the spring-disc system and allowed the picture to smoothly pull into synchronism.

The scanning disc used with the new motor was aluminum and about 8 inches in diameter with 45, one-inch focal length, one cm. lenses arranged in 3 interlaced spirals. It was important that the optical centers of the lenses be accurately located to provide a uniform scanning field without dark lines or overlapping lines. Careful hand-sorting enabled the use of relatively inexpensive commercially produced lenses, made by Simpson Instrument and Lens Co. of Chicago.

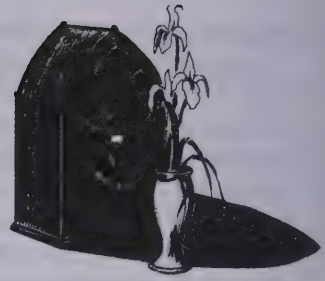
The lenses were seated in counterbored holes in the disc and carefully staked using a drill press. The counterbored holes were accurately located using a precision-made jig made on a Swiss boring mill. The cones and other parts were made on a small bench-lathe. It was determined that the set could be manufactured to be sold for 50 dollars.

The scanner was used in two new Western Television receiver models: a table model and a tall floor version called the "Empire State." In
(continued on page 24)

RECENT RADIO, TV AND ENTERTAINER OBITUARIES

COMPILED BY **CHARLES S. GRIFFEN W1GYR**

1225 NEW BRITAIN AVE., WEST HARTFORD, CT 06110-2405



Note: When known, the date of death is indicated in parenthesis.

DANIEL AARON, 77, (2-20-03) cable television executive. Aaron was the founder of Comcast Cable Television which last year acquired AT&T Broadband to become the largest cable television service provider in the country. The firm began in 1963 when he convinced Ralph J. Roberts, a Philadelphia entrepreneur, to purchase a small cable television system in Tupelo, MS. Aaron agreed to manage it and over the next thirty years built or acquired other cable systems throughout the nation. He retired as Vice Chairman of the firm in 1990. Aaron began his career as a business journalist where he learned about the infant cable industry. He wrote an article about Milton Schapp, founder of Jerrold Electronics, who operated one of the first cable firms to provide better TV reception. Aaron was later hired by the firm to handle public relations.

CHARLES R. "CHUCK" BENDER, W1WPR (ex-W3ODU), 79, (4-17-03) former station manager. Bender was an American Radio Relay League (ARRL) staff member and served as an operator of W1AW, the Maxim Memorial Station, from 1952 until his retirement in 1989. He was the Chief Operator of the station for the past 17 years. ARRL Chief Operating Officer Mark Wilson, K1RO, said, "For many League members, he was the visible, human face of ARRL Headquarters as he greeted visitors to the station during his tenure."

CHRIS BORGEN, 76, (4-25-03) television news reporter. Borgen, a former New York City police detective, was a news reporter on WCBS(TV) in New York City beginning in 1966. He appeared on the 6 p.m. and 11 p.m. newscasts and was the host of *Channel 2 the People* and *Channel 2 Eye On*. Borgen's Police Files series led to more than 40 felony arrests and the recovery of stolen property worth more than \$2.5 million. He began his television career when Walter Cronkite hired him to research and write for a report about prisons. Later he was offered full time employment with CBS where he remained until he retired in 1995. Earlier he held broadcasting jobs with the United States Information Agency and radio stations WINS and

WHCN in New York City.

FELICE BRYANT, 77, (4-22-03) songwriter. Bryant and her husband, Boudleaux Bryant, wrote an estimated 800 songs that were recorded and resulted in worldwide sales of more than half a billion copies. They wrote the Everly Brothers' *Wake Up Little Susie* and *Bye Bye Love* and Buddy Holly's *Raining in My Heart*. Their first hit was *Country Boy* sung by Grand Ole Opry newcomer Little Jimmy Dickens which became a Country Top 10 hit in 1949. Felice and Boudleaux were inducted into the Country Music Hall of Fame in 1991.

PEGGY CONKLIN, 96, (3-18-03) actress. Conklin starred in two dozen plays on Broadway from the 1930s through the 1950s and five films. She is best known for her screen role of Gabby Maple in *The Petrified Forest* (1936) opposite Leslie Howard and Humphrey Bogart. Some of her other stage credits include *Yes, My Darling Daughter* (1937), *Mr. and Mrs. North* (1941) and *Picnic* (1953). Film credits include *The President Vanishes*, *The Devil Is a Sissy*, *One Way Ticket*, *Her Master's Voice*, and *Having a Wonderful Time*. Her role as Pam North in *Mr. and Mrs. North* helped popularize the radio (NBC 1942-1946, CBS 1947-1955) and television (CBS 1952-1953, NBC 1954) series of the same name. On radio, Conklin was a cast member on *Big Sister* (CBS), *The Life of Riley* (CBS), *McGarry and His Mouse* (NBC 1946, Mutual 1947), *The Stu Erwin Show* (CBS 1945) and *That's My Pop* (CBS 1945). She made her Broadway debut in the chorus line of *Treasure Girl* in 1928.

CHARLES R. DOUGLASS, 93, (4-8-03) inventor of the "Laff Box." In the early 1950s Douglass got the idea of developing a "laugh machine" to enhance or substitute for audience reaction. As a result of that notion, he started Northridge Electronics and for the next 30 years provided recorded audience reaction for TV comedy programs. The device is now reduced to the size of a laptop computer. It can produce hundreds of human sounds, which can be mixed into 40 combinations or provide laughter from people from other cultures. Douglass joined CBS Radio in Los Angeles as a sound engineer in 1933. During World War II he served in the

Navy and was assigned to work with a team of engineers to develop shipboard radar systems in Washington, DC. After the war he returned to CBS as a broadcast engineer and during the 1950s became a technical director for many of the live TV shows.

RUSTY DRAPER, 80, (3-28-03) country and pop singer. Draper made recordings and performed on radio and television programs during a career that spanned over three decades. He is best known for his recordings of *Gambler's Guitar* (1953) and *The Shifting, Whispering Sands* (1955) which each sold over a million copies. Some of his other hits include *Seventeen* (1955), *Freight Train* (1957) and *Night Life* (1963). Draper appeared in the television westerns *Rawhide* (CBS) and *Laramie* (NBC) and performed twice on *The Ed Sullivan Show* (CBS). His stage credits include *Oklahoma* and *Annie Get Your Gun*. Draper also had his own radio shows in Los Angeles and San Francisco and earlier worked for WHO(AM) in Des Moines, IA. He began his career at 18 working in clubs in San Francisco.

NORVIN DUNCAN, 85, (4-25-03) television news anchor. Duncan joined the staff of WFBC(TV), now WYFF, in Greenville, SC as its first news anchor when it began broadcasting in 1954. Other positions he held with the station included Programming Director, News Director and host of interview programs and feature productions. Duncan retired from WYFF(TV) in the late 1970s. From 1939 until 1954 he was employed by WFBC(AM). In 1983 he joined the staff of WGGs(TV) as Assistant to the President. He began his broadcasting career at WWNC in Asheville, NC in 1935.

TEDDY EDWARDS, 78, (4-20-03) bebop tenor sax player. Edwards was a fixture at jazz and blues clubs located on Central Avenue in Los Angeles during the 1940s and 1950s. He is credited with the first tenor sax solo in the bebop idiom on *Up in Dodo's Room* which he recorded with trumpeter Howard McGhee in 1946. During the 1960s and 1970s Edwards performed with Benny Goodman, Milt Jackson and Sarah Vaughn, played club dates and recorded for the Contemporary, Pacific Jazz and Prestige labels. He began playing professionally when he was 12.

NOEL FOX, 63, (4-10-03) singer. Fox was a former bass singer with the *Oak Ridge Boys*. The group began in Knoxville, TN in 1943 as the *Oak Ridge Quartet*, singing country and gospel music. They've earned five Grammy Awards, four in gospel and one in country. He joined the *Oak Ridge Boys* in 1967, but left in 1972 for a music business career in Nashville, TN. In 1978 Fox began managing the Oak Ridge Boys' pub-

lishing firm, Silverline/Goldline Music Inc. He later served as Vice President of MCA Music/Nashville and President of Maypop Music Group, which was owned by members of the group *Alabama*.

IRVING FOY, 94, (4-20-03) vaudeville star. Foy was the last of *The Seven Little Foyes* that were headliners on the national vaudeville circuit from 1912 to 1928. The children became a part of the act when Eddie Foy, Sr., a solo entertainer, included them in a benefit performance. Their act consisted of singing, dancing and slapstick comedy routines. In 1915 Eddie, Sr. and the children appeared in a Mack Sennett short, *A Favorite Fool*, but the father didn't like motion picture work so returned to vaudeville. The family's story was told in the 1955 film *The Seven Little Foyes*, starring Bob Hope as Eddie Sr. and James Cagney as the showman George M. Cohan. In the 1940s Foy worked for the Interstate Theatre chain and during the 1950s operated a drive-in theater and ice cream business in New Mexico.

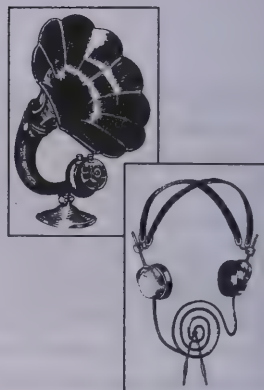
EDWARD L. GAYLORD, 83, (4-27-03) business executive. Gaylord was Chairman Emeritus of Gaylord Entertainment Company whose major holdings include Gaylord Opryland Resort and Convention Center in Nashville, TN, radio station WSM(AM), the *Grand Ole Opry*, and *Opry House*. Gaylord purchased Opryland for \$240 million in 1983. The transaction included the cable TV channels, The Nashville Network (TNN), Country Music Television (CMT), the Opryland Hotel, the Opryland Theme Park and the showboat *General Jackson*. Gaylord Entertainment later sold TNN and CMT for more than one billion dollars to CBS Corp. He was also Chairman and Chief Executive Officer of the Oklahoma Publishing Company which owns *The Daily Oklahoman* newspaper in Oklahoma City, TV stations and other properties. Gaylord had been Editor and Publisher of the newspaper since 1974.

CECIL H. GREEN, 102, (4-11-03) electronics executive. Green was Vice President of Texas Instruments from 1941 to 1951 and President from 1951 to 1955. Originally the firm was called Geophysical Service Inc.(GSI) and concentrated on seismic exploration for oil, but during WWII expanded into electronics producing submarine detection devices and radars. Green was hired by the firm as a seismographic field crew chief in 1932. On December 6, 1941 he joined with Eugene McDermott, J. Erik Jonsson and H. Bates Peacock to purchase GSI and in 1951 the name was changed to Texas Instruments (TI). The following year the firm entered

(continued on page 20)

RADIO REPRODUCERS

EDITED BY **DAVE CROCKER**, 35 SANTUIT POND RD., #4B, MASHPEE, MA 02649
PLEASE INCLUDE SASE FOR REPLY.



The Murdock Model 500 Speaker

The William J. Murdock Co. of Chelsea, Massachusetts had its beginnings four or five years before the turn of the 20th Century. Radio apparatus manufacturing started in the early teens with wireless components and the introduction of the Model 55 headphones—the ones with the adjustable, nickel-plated headbands.

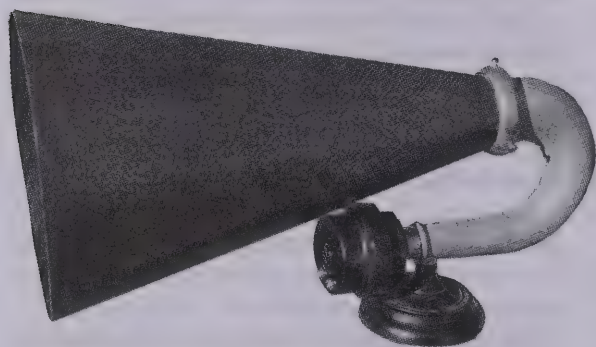
The more familiar Model 56, with cloth-covered headbands, appeared in 1924. These were the ones RCA included in the rear compartment of the Radiola I crystal set. But Murdock lost out when RCA chose Brandes phones to be included in their Radiola II receivers, a deal that put Brandes on the map!

The Murdock Model 500 horn speaker made its debut in 1924. The only other horn speaker made by the company was a standard-looking metal bell horn installed through the top lid of the

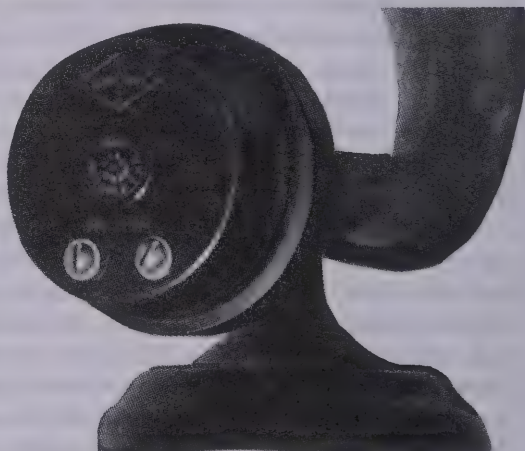
1924 Murdock Model 110 receiver.

The unique Model 500 has a horn made of wrapped, heavy fiberboard, riveted together to form a cone. The bell opening is a mere 7" wide. Its U-shaped neck is an aluminum casting connected to a molded "mud" Model 400 reproducer. The entire speaker measures 12½" long, overall, and stands 8¾" tall. The base is a molded Bakelite disc only 3½" round—which became one of the instrument's downfalls; it tipped over easily.

Due to the size and shape of the horn, which resembled a cheerleader's megaphone, the Model 500's sound pattern was very directional at best, and is small wonder that it led a short life. The speaker sold for only \$5 in 1924 and came with a notice, stating: "Not to be used with crystal sets." (Not a good sign). Because the heavy Murdock reproducer is a push-on fit, it's no wonder many 500s are found minus this original driver. ☐



The complete 1924 Murdock Model 500 horn speaker, shown in a rare position—standing upright!



The original and correct driver for the Model 500 is this often-missing Model 400 reproducer.

OBITS, continued from page 19

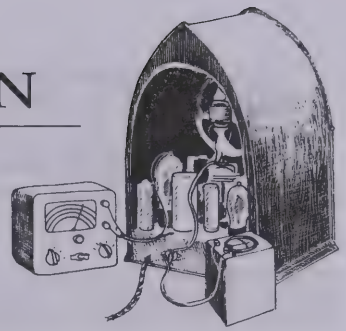
the semiconductor business and in 1958 developed the integrated circuit. Currently TI has sales of \$8.4 billion and employs 43,000 in more than 30 countries.

GRAHAM P. JARVIS, 72, (4-16-03) character actor. Jarvis appeared in films, television and theater, but is, perhaps, best remembered for his role

as Charlie Haggars on the TV soap opera *Mary Hartman, Mary Hartman* (Syndicated, Network late night 1975-1978 and reruns on The CBS Late Movie 1980). Other television credits include *Making the Grade* (CBS 1982) and *Fame* (NBC 1985-1987). Some of his theater appearances include *The Best Man*, *Much Ado About Nothing* and *The Rocky Horror Show*. Jarvis, who began acting at 19, studied acting at the American The-

EQUIPMENT RESTORATION

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ABOVE ADDRESS, INCLUDING SASE FOR REPLY.



Andy DuBois' Last Project

Alton "Andy" DuBois, Jr. (Queensbury, NY) became a Silent Key in April. He was 84 (that's why we are called "old timers"). Andy spent 32 years with the RCA Service Co. and was a prolific contributor to this column and our hobby. Andy was active in restoring clocks — small ones and large ones (like in court houses).

Andy and I corresponded for years and finally met each other at the 2001 AWA Conference and again in 2002. This contribution, received several months ago, is his last.—ko

About a year ago, I bought a small plastic radio made by Westinghouse. It was a 6-tube superhet, Model WR-120. I found it on a shelf almost hidden by other items and got it for \$10. It had a cracked cabinet and was very dirty. The set had been worked on before, parts were disturbed, and the ballast tube was missing.

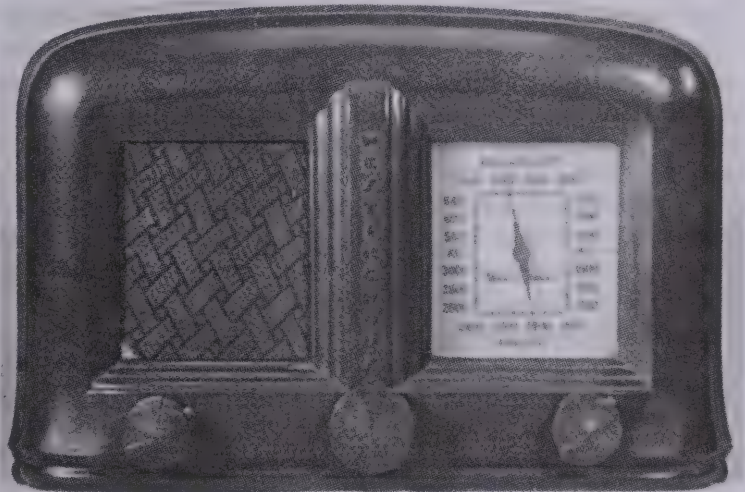
I obtained a diagram and resistance values for the missing ballast. then I made up a substitute ballast by wiring the appropriate resistors into an old octal tube base and fired up the set with a Variac. It came to life at about 100V with a loud hum. I then replaced the filter capacitors which was not easy in such a small, confined chassis.

The tuning capacitor was filthy, so I removed and cleaned it in my ultrasonic cleaner. After it was dry, I lubricated the bearings with Wahl clipper oil. The tubes all checked out OK. After alignment, the set played nicely.

Later I found a source for the Type K49CB ballast for \$10 and replaced my homemade ballast. My substitute got much too hot, and I was

afraid it would damage the cabinet.

I repaired the cracked cabinet with Gorilla Glue. The crack was only on the lower edge of



Andy's Westinghouse WR-120

one side. After smoothing the repair with steel wool and applying some stain and furniture polish, it was almost invisible.

CAUTION: Be very sparing with the Gorilla Glue. It expands to a hard foam outside the crack if too much is used. You have to use a Dremel tool to remove excess. 

ater Wing and was an original member of the Lincoln Center Repertory Theater.

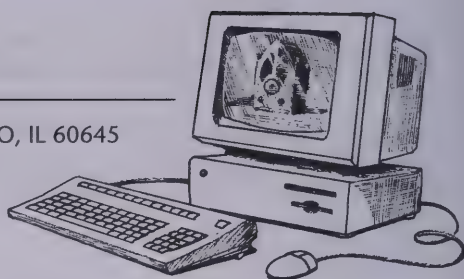
SUSAN JOHNSON, 75, (2-24-03) actress. Johnson played the "coquettish big-voiced main" in Broadway's 1956 production of *The Most Happy Fella* which won her a Theater World Award. She appeared on *The Ed Sullivan Show* a number of times where she performed *Big D* from the show. Other Broadway credits

include *Buttrio Square* (1952), *Carnival of Flanders* (1953), *Carefree Heart* (1957), *Oh, Captain!* (1958), *Whoop-Up* (1958) and *Donnybrook!* (1961). Johnson got her big break when she joined the chorus in the original Broadway production of *Brigadoon* in 1948. She later repeated the role in a City Center revival in 1950 and on the studio cast recording.

(continued on page 23)

ON THE INTERNET

EDITED BY **CHUCK SCHWARK**, 7454 N. CAMPBELL AVE., CHICAGO, IL 60645
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International Shortwave Broadcasters on the Web

Last time we talked about radio monitoring and shortwave listening resources from the receiving end of things. This time, I've flipped the coin over and we'll take a quick look at the broadcasting end of the "wireless" circuit. In this day and age, news of world events and other kinds of communications come to us via many different media, but it all started out in the "aether."

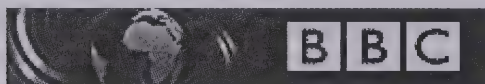
Soon after wireless was developed, nations saw opportunities not only to conduct commercial and military traffic, but also to reach out to other countries with cultural exchanges and news. Although today's satellite and internet telecommunications have supplanted many of the direct or relayed shortwave transmissions, there still is excitement to be had on the air waves and educational and cultural experiences await the shortwave listener.

Most international broadcasters also have an internet presence where you can download their transmission schedules. Many also have program listings on cable television and satellite channels. Here are a just a few of the most popular and well known stations. Just spin the dial and listen...

BBC World Service

<http://www.bbc.co.uk/cgi-bin/worldservice/psims/ScheduleSDT.cgi>

Since it was first formed as a company in 1922, five years before it received its first Royal Charter and became the British Broadcasting Corporation, the BBC has been a world leader in program production providing international news, analysis and information in English and 42 other languages.



Deutsche Welle

<http://www.dw-world.de/english>

Deutsche Welle started broadcasting on May 3, 1953 with just a German service; the Allied High Commission refused to allow anything else at that time. Today, Deutsche Welle has devel-

oped into the voice of Germany with loyal listeners around the world.

HCJB, Quito, Ecuador

<http://www.hcjb.org/>

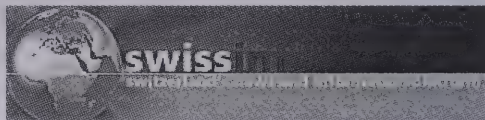
HCJB World Radio, the world's first missionary broadcaster, has been on the air since 1931. Together with its local partners, HCJB World Radio broadcasts in nearly 120 languages and dialects.



Swiss Radio International

<http://www.swissinfo.org/sen/swissinfo.html?siteSet=100>

Swiss Radio International (SRI) is an enterprise of the Swiss Broadcasting Corporation (SRG SSR idée suisse). SRI informs Swiss living abroad about news and events in their home country, and to increase other people's awareness of Switzerland outside the country.



International Listener

<http://home.houston.rr.com/edmayberry/International%20Listener%20Shortwave%20Radio%20Stations.htm>

I have included this website as a good jumping-off point for shortwave broadcaster web sites beaming English-language broadcasts around the world. Also included is a listing of web broadcasts from some international stations.

Radio Australia

<http://www.abc.net.au/ra/>

Radio Australia is the international radio and online service of the Australian Broadcasting Corporation, the ABC. Broadcasting to the Asia Pacific region for over 60 years in languages including English, Pidgin, Chinese, Vietnamese, Khmer and Indonesian.

Voice of America

<http://www.voa.gov/>

The Voice of America has carried United States, regional, and world news to listeners around the globe for more than 60 years. Today,



VOA broadcasts in more than 50 languages to listeners around the world.

Radio Netherlands Wereldomroep

<http://www.rnw.nl/cgi-bin/home/enhome.pl>

The Netherlands was the first country in Europe to start regular shortwave broadcasting. After a series of tests, the Philips company started regular transmissions to the Netherlands East Indies (now Indonesia) in

1927. Radio Netherlands

Radio Netherlands



first started broadcasting in 1947 and currently broadcasts radio programs and publishes Internet pages in six languages: Dutch, English, Spanish, Portuguese, Indonesian and Papiamentu. 

OBITS, continued from page 21

ALAN KEITH, 94, (3-18-03) radio host. Keith, who was believed to be the oldest regular voice on radio, was associated with the BBC for seventy years. He hosted a weekend Radio 2 show *Your Hundred Best Tunes* for 44 years. Keith conceived the idea for the *100 Best Tunes in the World* in 1959 and was given a contract by the BBC to host a thirty minute program for 13 weeks. The show was a success and in 1960 the time slot was extended to an hour and the name changed to *Your Hundred Best Tunes*. Keith, who began working on radio dramas in 1933, for many years acted on stage and in the movies and television. He was awarded the OBE in 1991.

ANDREA KING, 84, (4-22-03) actress. King was best known for her roles during the mid-1940s in the Warner Bros. dramas *God is My Co-Pilot*, *Hotel Berlin*, *The Man I Love* and *The Very Thought of You*. Other film credits include *The Beast with Five Fingers* (1946) starring Peter Lorre and Robert Alda and as Lillian Russell in the musical *My Wild Irish Rose* (1947). King starred opposite Edward G. Robinson in *Witness for the Prosecution*, which aired live on the Lux Video Theatre (CBS-1953.) She made guest appearances on many television shows and for her early work in the new medium she was honored with a star on the Hollywood Walk of Fame.

JIM MAXWELL, W6CF (ex-W6CUF, DL4QX, DL4RX and G5CRE) 69, (2-6-03) technical consultant. Maxwell, who held doctoral degrees in aeronautical engineering and biomechanics, retired from Lockheed Missiles & Space Company in 1992 and was a consultant for Scitor Corp. from 1992 to 1998. Maxwell held leadership positions in many amateur radio organizations including the American Radio Relay League (ARRL). He was elected ARRL Pacific Division Vice Director in 1994 and Director in 1999. Maxwell was particularly interested in pre-

serving amateur radio and ARRL history and served as a key member of the ARRL Historical Committee. He was also a member of the ARRL Technology Task Force (1999-present) and Board Liaison to the ARRL RF Safety Committee (1994-present). Maxwell began his career as a shipboard radio operator.

BARNEY MORRIS, 66, (3-15-03) broadcast journalist. Morris was a news anchor and reporter at KABC(TV) and KTLA(TV) in Los Angeles for nearly thirty years. He joined KTLA in 1970, but two years later joined KABC co-anchoring its *Eyewitness News* for three years. He left the station in 1975 to become the news anchor at the CBS affiliate in Philadelphia, but returned to the West Coast in 1976 to work for KFMB(TV) in San Diego. He rejoined the staff at KABC in 1980 and remained there until his retirement in 1995. Morris began his career at a radio station in Monroe, MI and later got his first television job at WXYZ in Detroit, where he anchored and reported on the city's riots in 1968.

OGDEN PRESTHOLDT, 85, (2-1-03) radio engineer. Prestholdt began his career as the first Director of Technical Operations at WLOL in Minneapolis in 1938. In 1943 he joined the Engineering Department of CBS in New York City where he supervised the rebuilding of the original WCBS television transmitter on top of the Chrysler Building and built a transmitter at the Empire State Building. He was Director of Engineering at CBS from 1961 to 1969. Prestholdt was a partner in A.D. Ring & Associates, a consulting firm in Minneapolis, from 1969 to 1984. In retirement he was a consultant with du Treil, Lundlin & Rackley, Inc., a subsidiary of A.D. Ring, P.A. For his work in the radio antenna and transmitter fields he received many awards including Life Fellow of the Institute of Electrical and Electronics Engineers (IEEE), recipient of the IEEE Centennial Medal Award and Engineering Achievement Award from the National

Association of Broadcasters (1996).

FRED ROGERS, 74, (2-27-03) children's television pioneer. Rogers was host of *Mister Rogers' Neighborhood* which began nationwide on National Educational Television, the forerunner of PBS, in 1968. The last episode was taped in December 2000 and was shown in August 2001, although some 300 of the 1700 shows he made will continue to be aired. In his quiet way he dealt with the emotional life of children through songs, stories and heart-to-heart talks. Rogers began his television career in 1953 assisting with programming at WQED in Pittsburgh and a year later produced and wrote *The Children's Corner*. He first appeared on TV in 1963 when the Canadian Broadcasting Corporation invited him to host Mister Rogers. He returned to WQED in 1966 where Mister Rogers' Neighborhood was developed and telecast regionally on stations affiliated with Eastern Educational Television. Rogers, an ordained minister, received many awards including four daytime Emmys as a writer and performer, the Lifetime Achievement Award of the National Academy of Television Arts and Sciences (1997) and last year President George W. Bush gave him the Presidential Medal of Freedom. He began his career with NBC in New York City in 1951.

JERRY WILLIAMS, 79, (4-29-03) talk show pioneer. Williams, who is credited with making

the talk radio format a force for political change, hosted an afternoon talk show on WRKO(AM) in Boston during the 1980s. He left the station in 1998 and went into partial retirement. Williams began his radio career in Bristol, TN in 1946, and later went to work for WMEX(AM) in Boston. There he started doing issues-oriented talk shows in the 1950s. In 1968 his audience expanded when he joined WBZ(AM), same city, and the program was carried by stations in 38 states and Canada. In 1976 he joined the staff of WMCA(AM) in New York City and a year later became the first FM talk host when he moved to WWDB in Philadelphia.

Information for this column was obtained from *The Complete Directory to Prime Network TV Shows 1946-present* (4th ed.), *The Encyclopedia of Jazz* (1st ed.), *The Hartford Courant*, *On the Air: The Encyclopedia of Old-Time Radio*, *QST*, www.afce.org, www.bbc.co.uk, www.broadcastingcable.com, www.cgi.tennessean.com, www.dlr.com, www.gaylordentertainment.com, www.theinstitute.ieee.org, www.latimes.com, www.nytimes.com, www.pdarrrl.org, www.seattletimes.com, www.thecarolinachannel.com, www.theinstitute.ieee.org, www.2arrrl.org, and www.variety.com.

Thanks to Dr. A. David Wunsch for additional source material. 

TELEVISION, continued from page 17

both models the picture was viewed on a translucent screen and could be seen by a number of viewers at once. The lenses projected the light from a special "crater" lamp developed by Garner. The tiny but intense light source produced a fairly bright picture on the screen, which was several inches square.

The brightness of the projected picture may be appreciated by the fact that life-sized images of faces were successfully shown (on larger screens) to audiences of several hundred people in an auditorium! Although the pictures were hardly brilliant, they were recognizable.

The radio receivers used in these sets were made by the Echophone Radio Mfg. Co. in Waukegan, Ill. A couple hundred of the new sets were made. In February 1932, Garner and I delivered a dozen table models to First National Television run by Jerry Taylor. They were operating a television station using Western Television scanners.

In the spring of 1932, I helped install Western

Television equipment at the State University of Iowa where the Electrical Engineering Dept., under the direction of Prof. E. B. Kurtz, operated television station W9XK. Prof. Kurtz discusses the W9XK operation in considerable detail in his book, "Pioneering in Educational Television" published in 1959 by the Ford Foundation. The equipment used at W9XK is now at the Smithsonian Institution. Sanabria demonstrated his television techniques at the 1933-1934 Chicago Worlds Fair using a large screen. Western equipment was also sold to CKAC in Toronto and a number of other stations. Experimental Television using Western Television equipment was broadcast by *The Milwaukee Journal* on W9XK from 1930 to April 1938. At that time, they converted to electronic television. W9XAP (*Chicago Daily News*) stopped broadcasting mechanical television on March 31, 1933. In the summer of 1934, I switched to the development of electronic television, accepting a position with Philco in Philadelphia. 

THE VACUUM TUBE

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Some Notes on Cathode-Ray Tubes

This column presents “where-used” information on numerous small cathode-ray tubes (CRTs) of collector-restorer interest. These were used mainly in oscilloscopes, but also as indicators in a whole array of devices: radars, automatic direction finders, identification-friend-or-foe (IFF) gear, radio altimeters, LORAN navigation receivers, spectrum analyzers, panoramic adapters, modulation monitors, and specialized test sets. A few even appeared in TV sets.

Many of these tubes were made in variants with differing screen phosphors, giving varying color and persistence of image. For quick reference, the most usual phosphors were:

Screen	Usual Use	Color/Persistence
P1	most 'scopes	green/medium
P2	prof. 'scopes	blue-green/long
P4	B & W TV	blue-white/short
P7	radar displays	blue-green + yellow/long (minutes)
P11	photo recording	bluish/short

Often professional-grade 'scopes could be ordered with any of several variant CRTs. The Hewlett-Packard 150A, for example, had options for a 5AMP1, 5AMP2, 5AMP7, or 5AMP11.

The accompanying “CRTs IN EQUIPMENT” where-used table lists the CRTs in a goodly variety of 'scopes and other devices. It was developed from the two Rider books on 'scopes [1, 2], three summaries of military test gear [3, 4, 5], and some general scrounging. In some cases the tube is identified with the phosphor number left out [“()”], denoting a unit with multiple options. However, in these cases the most common phosphor remains P1.

The table may be helpful in an e-Bay or flea-market context in locating junker 'scopes, etc., that contain useful or collectable tubes. A forlorn Du Mont 168, depending on vintage, may contain a 54XH CRT, with its beautiful clear-glass bulb in the class of the prized Western Electric 224A. An orphan Du Mont 164 may provide a 34XH, a similar but smaller tube. Numerous early 3" 'scopes used the RCA 906 tube, whose initial production (into 1935) was similarly clear-bulbed.

Where a 'scope appeared with the 906 CRT, later renumbered 3AP1, the “906” is shown to emphasize those units that may have the early-vintage tubes. Other renumberings that occurred in the '40s were 1802P() to 5BP() and 1805P1 to 5AP1.

This is not to encourage wholesale scrapping of old 'scopes, particularly the '30s ones. However, there is such a glut of '40s-'60s Eicos and the like, and such a cheap supply of “real” 'scopes like Tektronix models, that it is no great crime to extract the CRT to fix a panadapter, modulation monitor, or other more interesting instrument.

A few tubes, of TV-restorer interest, came with a phosphor for oscilloscope or black-and-white TV. The 3KP4 was designed with P4 phosphor for the Pilot TV-37 3" TV set, but was more successful commercially as the 3KP1 in 'scopes. Thus several otherwise dead-end 'scopes will yield 3KP1s, useful for testing (or even operating) the TV-37 in lieu of the now-“unobtainable” 3KP4. Such source 'scopes include the GE YNA-4, Millen 90903, RCA WO-79, Simpson 480, and military OS-4/AP. The 5BP4, used in prewar TV sets (RCA TRK-5 and TT-5, GE HM-171 and HM-185) also appeared in several wartime radar indicators and was plentiful enough in surplus to be used in some Heathkit O-7 'scopes in lieu of the far more common 5BP1. The 7JP4, another tube in early postwar television, had a P1 version also — used in the Eico 470 and Precise 300B 'scopes.

Speaking of the 3KP4, there may be some insight into this tube's commercial history from the Dowd-RCA archive. “Identical with 3KP1 except that it uses the P4 phosphor,” it was introduced in mid-1948, “limited for sale to Pilot Radio Corporation only” and “pending determination of the commercial possibilities of low-priced, small-size television receivers.”

The expected sales were 25,000 tubes in 1948 and 75,000 in 1949. Pilot, of course, had priced its 3" set just below \$100 (1948 dollars), hoping for good sales volume.

In early 1949 the sales picture had changed: “After a trial of six months, Pilot has decided to discontinue this model and has cancelled their remaining tube orders. Since this company has a

good record of merchandising this type of product, we consider it unlikely that any other concern would be any more successful at this time.”

With a RCA inventory of 3000 tubes, the 3KP4 was “limited to sale for renewal purposes only,” with enough tubes on hand to take care of requirements “for a considerable period” [6]. (Of course, if sales had been good, the tube people at RCA would have been tempted to tip off their set-designer cousins at RCA Victor!)

In light of this sales failure, it is surprising how many TV-37s — now highly collectable — have survived.

In terms of equipment restoration, at one time the TV-service market featured adapters to allow an ordinary tube tester to measure emission and gas in a picture tube. These were not particularly adapted to the small-CRT field, where testing by substitution had been more usual. There were also picture-tube reactivators like the RCA WT-333B, which could restore emission to a weak cathode by discharging a capacitor (say, 20 μ F charged to 250 volts) between the grid and cathode of the tube. A limiting resistor of a few ohms restricted the current, but the often-successful process was rather violent.

Sometimes simple external checks of a suspect tube will be helpful. The screen may have a spot or line burned in it (‘scope tubes) or an ion burn (picture tubes). Old-time TV servicers knew how often an apparently open heater could be fixed by resoldering the heater pins on the base.

It may be helpful to mention the TV picture-tube “brighteners” and “rejuvenators” of the ’50s. These were small transformers that plugged in between the socket and base of the tube. Various models were available to improve brightness of a tube having low emission by boosting its heater voltage to, typically, 7.8 volts, or to remove the effects of a heater-to-cathode leak by providing an isolation transformer, or both. (The writer once saw a TV set where *two* voltage boosters had been used in tandem.) Dif-

ferent versions were available for series- and parallel-string TV sets.

These units are often found in old service technicians’ tube caddies and should be saved: they can still be used to stretch out the life of a weak or leaky tube. The transformer from an isolation type can also be removed and rewired as a 6.3-to-12.6-volt autoformer. This potentially allows replacement of, say, the rare 7S7 tube in an RME 84 communication receiver with a not-so-scarce 14S7. The autotransformer takes up less space under the chassis and is less messy than wiring up a voltage doubler for the same purpose.

For anyone interested in CRTs generally, Peter Keller’s 1991 book [7] remains the “Tyne” of its field. It has been nearly out-of-print in recent years, but Amazon.com still listed one copy as of late June. Other sources on the Web may still carry it.

REFERENCES

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2. As [1], 2nd. ed., 1959, pp. 23-3 to 23-232.
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4. *Technical Order T. O. 33A1-1-13*, “Electronic Test Equipment” (Washington: Dept. of the Air Force, 1957), pp. 351-407.
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CRTS IN EQUIPMENT

CIVILIAN GEAR

Aeroquip 10,000	5BP1 or 5LP1
Bendix 160	3AP1
Beta Electronics 701	3NP4
Browning Model 2	2511A4
Browning OL-15B	5JP()
CAA CA-2521 (Hycon)	5CP1 or 5CP1A
CENCO 71552	5CP1
Clough-Brengle CRA	906
Cossor (Canada)	
1039 M Mk II	24D
1049 M Mk III	89J
1058	91D
Du Mont	
164	34XH, 3AP1 or 3AP5
164E	3AP1 or 3AP5
168 (OS-1/U)	54XH or 5MP1

175A (I-245)	5LP()
208, A, B	5LP1 or 5LP5
224A	3GP1
241 (TS-324/U, Navy	
60109, Navy OCG)	5JP()
247	5CP()
250A	5CP()
250AH	5RP()
256D (OS-5/U)	5CP()
274, A	5BP1
275A	5CP()
279	5SP()
281A	5RP()
292	3RP1A
293	K1068P()
294A	5XP()
301A (AN/USM-32)	3WP()
303A	5XP()A or 5YP()

303AH	5XP()
304	5CP()
304A	5ADP()
322	5SP()
323A	5AMP()
327	5AMP()
329A	5ATP()
331	3WP()
336A	5ATP()
340, 341	5AQP()
350, 401A	5ADP()
403	5AQP()
411	5ARP()
EG&G 2236A	KR-3B
Eico	
400, 425	5BP1
460	5UP1
470	7JP1

Electronic Meas. Corp. 600 5UP1	9788 914	BC-612 5BP4
Electronic Tube Corp. K-260 62DRP (2-gun)	WO-27A 5UP1	BC-665-T2 5BP4
Electronic Tube Corp. K-470 74DRP (4-gun)	WO-55A 3MP1	BC-704 5BP1 or 5GP1
ETC H-21 5SP()	WO-56A 7JP1 or 7VP1	BC-718A 3AP1 or 3AP4
Fed. Tel. & Radio NLS-518 3 AP1	WO-57B 3MP1	BC-719, A 5HP1 or 5HP4
Feiler TS-4A 5BP1	WO-58A, 60C 5UP1	BC-910 3EP1
General Electric CRO-5A 5CP()	WO-78A, B 5ABP1	BC-929, A 3BP1
ST-2A, 4ST2A1 5UP1	WO-79A, B 3KP1	BC-956 5BP1
YNA-4 3KP1	WO-88A, 91A 5UP1	BC-957A 5HP4
General Radio 635A 635-P1	Simpson 458, 466 5UP1	BC-986A 12GP7
687A 905	480 3KP1	BC-993B 3EP1
699 906	535 24XH	BC-1035A 5CP1 (two)
699A 3AP1	545 906	BC-1060A 3GP1, A
1109A 3DP1A	546, A 3AP1	BC-1084A1 5GP1
Hewlett-Packard 120A, 122A 5AQP()	555 913	BC-1087 3BP1
150A 5AMP()	560A, 650 3AP1	BC-1088 3DP1
151A (AN/USM-105) 5AMP()	655 (options) 3AP() or 5CP1	BC-1098 2AP1
Hallcrafters SP-44 2AP1	Supreme 555 906	BC-1111 12EP1, 12EP8, or 12HP7
Heathkit O-4 5BP1	Supreme 660 5CP()	BC-1112 5AP1
O-7 5BP1, 5BP4, or 5GP1	Sylvania 101 5BP1	BC-1159 5BP1
O-10 5UP1	131 3AP()	BC-1159A 5NP1
OL-1 3GP1	132 7GP1	BC-1184A 5CP1
OM-1 5BP1	132-Z, 400, 404 7JP1 or 7VP1	BC-1213B 7CP1
OP-1, OR-1 5ADP2	405 5UP1	BC-1214 7CP1
Hickok 193 3AP1	Tektronix 310 3WP()	BC-1266A 5CP1
195, B 5UP1	311 T31P2	BC-1268A 5CP1
305 3AP1	315, D 3WP2	BC-1287A 3BP1
505A, 675A, 685 5UP1	316 T32P2	BC-1293A 5CP1
770 5ABP() or 5ADP1	502 T60P2 (2-gun)	I-102A 3CP1
RFO-1, 4 906	511 (late) 5ABP()	I-134B (Du Mont 241) 3GP()
RFO-5 3AP1	511A (early) 5CP()	I-152A 3DP1-S1
Hycon 49 (OS-8/U) 3RP1A	511AD 5CP() or 5ABP()	I-152AM 3DP1
617-T 3RP1A	512 (OS-48/U) 5CP() (see 5ABP)	I-212 2AP1
627-R 3WP1 or 3WP11	513 (early) 5XP()	I-240 913
ITT Indust. Prod. Div. 2135D 17QP() or 21ECP7	514, A 5CP1	I-245 (Du Mont 208) 5LP()
Jackson 520 906	514AD 5CP()A or 5ABP()	ID-3/APQ-5 5FP7
Jackson CRO-1, -2 5UP1	515A T55P2	ID-6/APN-4 5CP1
Knight 83YU144, 83YZ144 5UP1	524AD 5ABP()	ID-8/CPN-2 3BP1
Knight 83YZ146 5CP1	536 T56P2	ID-11/APS-4 3FP7
LFE 401 5YP()	545 T54P()	ID-12/TPS-1 3BP1 + 5FP7
LFE 411 5ABP()	545A T12G, HD2607, or 5BHP2	ID-13/AN/CPN-3 2AP1
Maguire 60ACF 2AP1	Television Eqpt. Co. T-602 5RP()	ID-16/TPS-1A 5CP1 + 7BP7
Millen 90902 2BP1	Trad Telev. PO-400 (AN/USM-38) 3WP()	ID-17/APN-3 3DP1
90903 3KP1	Triumph 800 906	ID-19/APS-3 5FP7
90905 5UP1	840 3AP1	ID-30A/APS-2D 5FP7
90915 5AQP()	841, 850 3BP1	ID-31/APQ-10 3FP7 + 5FP7
90923 3XP()	830 (Navy 60018) 3AP1	ID-33/APA-6 3BP1
P4, -2 5LP()	United Sound Eng. CR-3 906	ID-36/MPN-1 Two 7BP7
Modern Electronics 830 3GP()	Waterman S-10-A, B 2AP1	ID-37/MPN-1 Two 7BP7
National CRU 2AP1	S-11-A, S-12-A 3MP1	ID-41/APQ-13 5FP7
Paco S-50 5BP1	S-12-C 3RP1A	ID-50/APA-5 3FP7
Paco S-55 5UP1	S-14-A, B, C 3RP1A	ID-51/TPS-3 5CP1 + 7BP7
Panoramic (panadapters) PCA-2 2AP1	S-15-A 3SP1 (two)	ID-66/AXR-1 7CP1
PR-1 3BP1A	S-16-A 5BTP1	IE-20 3GP1
SA-3 3AP1	S-17-A 3YP1	OBL 3BP1
T-200 902A	S-5-B (AN/USM-24) 3JP1	OBT (Du Mont) 3GP1
Philco 7008 3MP1	Weston 983 Type 2 5ADP()	OCG (Du Mont 241, TS-324/U) 5JP()
Polarad TSA spectrum analyzer 5ADP()	Weston 983 Type 3 5UP1	OS-1/U (Du Mont 168) 5MP()
Precise 300B 7JP1 or 7VP1	MILITARY GEAR	OS-4/AP (ANURM-25) 3KP1, 3SP1, or 3WP1
Precise 308 8CP1	AN/APA-10 3BP1	OS-5/U (Du Mont 256D) 5CP1A
Precision ES-500, A 5CP()	AN/APA-38 3BP()	OS-7C/U 3DP1A
Precision ES-550 5CP1A	AN/APQ-5 3BP1	OS-8/U (Hycon 49) 3RP1, A
Radio City Products 55 5BP1	AN/CPS-5 5CP1 + two 12DP7	OS-8C/U 3RP1
550 5BP1	AN/MPG-1 2AP1 + two 7BP1 + 7BP7	OS-10A/U 5UP1
TV-90 3BP()	AN/TPL-1 Two 2AP1 + 5CP1	OS-48/U (Tektronix 512) 5CP()A
RCA 151, A 913	AN/URM-25 (OS-4/AP) 3KP1, 3SP1, or 3WP1	R-36/TPS-2 5CP1
151-2 902	AN/USM-24 (Waterman S-5-B) 3JP1	R-65/APN-9 3BP1
155 906	AN/USM-24A, B, C, D 3JP1	R-70/APS-15 2AP1 + 5FP7
155A, B, C 3AP1	AN/USM-25A, B 3WP1	TS-28/UPM 5CP1
158 (TS-489/U) 5BP1	AN/USM-32 (Du Mont 301A) 3WP1	TS-34/AP 2AP1
160, B 5BP1	AN/USM-38 (Trad Telev. PO-400) 3WP1	TS-54/AP 2AP1
304A 914	AN/USM-105 (H-P 151A) 5AMP()	TS-64/MPN-1 3AP1
327A 914	BC-403C 5BP4	TS-100/AP 3DP1
715B 5UP1	BC-403D 5BP1	TS-126/AP 2AP1
9545 3AP1	BC-412A 5BP1	TS-149/TRC-6 3BP()
	BC-412B 5BP1, 5BP4, or 5HP4	TS-198/CPM-4 3BP1
		TS-239/UP 3JP1
		TS-262A/TPS-10 3BP1A
		TS-324/U (Du Mont 241, Navy OCG) 5JP()
		TS-489/U (RCA 158) 5BP1
		TS-678/U 3JP7
		60018 (Navy / Triumph 830) 3AP1
		60109 (Navy / Du Mont 241) 5JP1
		60ACF (Navy) 2AP1
		60ACZ (Navy) (CRP-60ACZ) 3DP1, A

BY LARRY BABCOCK

REPORT ON NIAGARADIO 2002

Photos by the author.

Every year, right after the conclusion of this joint NFWA/AWA meet, Larry Babcock writes it up for The OTB. He asks me to hold the report for the following August issue so that it will be fresh in people's minds when making their radio meet plans for that month. This year is no exception so—we give you Niagaradio 2002 and hope you will be able to attend Niagaradio 2003. It is to be held August 9th. See "AWA News" for more details—ed

This was another good year for the antique radio meet sponsored jointly by the AWA and the Niagara Frontier Wireless Association (NFWA). It was held at the Amherst Museum north of Buffalo, NY on 10 August 2002. There was the usual crowd of just under 200 people and my wife, Dorothy, reported good sales at our table. We had a new product for sale this year. It was a 60 page book on the radio history of the WurliTzer company, 1924-1937.

About 25 -30 years ago I had the habit of buying any cheap radio I saw at the flea markets. I

wrapped them in newspaper and piled them up in the attic. Now I take a dozen down each year for this meet and they sell well for ten or twenty times what I paid for them! For example, a Majestic tombstone with chrome grill and dial scale went for \$100. For that price, the buyer didn't mind that the chrome needed replating. I had purchased it for \$5 in 1974.

I would expect that a young person could do the same thing today. Probably any tube set will be a lot more valuable in another 20 or 30 years if you are able to wait that long.

We also noticed that the bottom has dropped out the novelty transistor market. We have not sold a single one for several years despite cutting the price drastically. Tubes, on the other hand sold very well. Good 01As now sell for \$10 easily and 71As for quite a bit more than that.

We did more than just sell at our table. We also had on display an album of photos taken at the July 2002 meet of the Michigan club in Lansing, MI. Lots of local collectors who have never been to that meet enjoyed the pictures. We also

had a program of old time radio commercials and programs playing from an old folded *papier mache* horn. It included a long Atwater Kent commercial. We drove this horn from a modern tape player and used an old output transformer backwards to match the 2000 ohm speaker impedance with the 8 ohm impedance of the tape player. Not a perfect match but it worked very well and gave good volume. Try it when you want to check out an old speaker!

I also displayed my Orphan Annie collection for the first time and it at-



Here's part of my flea market setup, with wife Dorothy minding the store.

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tracted a lot of attention. I filled a 10-ft. table with items stacked on top of items, to get them all in. There were books, framed comics from the 30s and 40s, premiums from the radio show and items from the later Orphan Annie movie and stage play. The Orphan Annie theme was so different from the comics of today! It was all about teaching kids to work hard, be good and live an honest life.

I wasn't surprised to see Ed Gable, the Curator of our AWA museum, because he comes to this meet every year. He sold some nice items and also contributed to our donation auction, which the NFWA appreciates. In addition to the donation auction there was



It's a pleasure to shop in the relaxed park-like atmosphere of the Amherst Museum grounds.

an auction sale of collector's objects. This ran about an hour and there were some good bargains. One very large box looked to be full of ordinary tubes but it sold for \$80 and the successful bidder found two WD-11 tubes (condition unknown) in the bottom. A 1932 Gernsback trouble shooting manual sold for \$18.

So many of the big antique radio meets are adjacent to a noisy thruway but this meet is at the Amherst Museum, way out in the country in a park-like setting among a group of historical buildings which have been moved to the location. Sellers set up between trees on a lawn along the museum drive. There is plenty of room for expansion. The museum opened an hour early at 11:30 a.m. so people attending the meet could also visit (at no additional cost). This year besides the usual exhibits the museum displayed a beautiful collection of Winslow Homer paintings. There was also a room full of old radios sponsored by the NFWA (the contents are changed periodically). There was a collection of early TVs, including a mechanical disk set and the Baird receiver to go with it. Adjacent was a display of 1920s broadcast receivers and a 1920s radio service bench with all the old test equipment and parts.

People love coming to this meet and the same faces are seen every year. We hope to add yours in August, 2003! 📷



This very nice Crosley Pup, with the original box, won both a first prize blue ribbon and the Best of Show award in the equipment contest.

SUBSTITUTES FOR THE WD-11

Westinghouse introduced the WD-11 tube in 1922 for their Aeriola, Sr. (Model RF). They needed a tube which could be heated with dry cells instead of storage batteries. The WD-11 was also used in the RS, Regenoflex, Radiola X, Radiola III and Radiola III-A, sets made for RCA by Westinghouse. The development of this tube is well documented [1].

General Electric developed the UV199 tube independently, with the same objective of economical dry cell operation. The UV199 was introduced in 1923 with the Radiola IV. Its characteristics were similar to the WD-11 except for the filament demand of 3.3V/.06A vs. 1.1V/.25A for the WD-11. Besides its filament economy, the UV199 was also more robust and less microphonic.

The filament structure of the WD-11 is notoriously delicate. When a filament burns out, it may flop against the plate applying B+ to the filament circuit with disastrous results [2]. RCA chose the UV or UX199 for subsequent superheterodyne and regenerative receivers. No apparatus using the WD-11 was designed after 1924, and it became obsolete so quickly that RCA issued Service Bulletin #6 (Dec. 11, 1925) showing how to convert the Radiolas III and III-A to UX199 and UX120 tubes [3].

Westinghouse issued the WD-12, a UV-based version of the WD-11, in 1923. It was replaced by the UX-based WX-12 in 1925 for converting storage battery sets to dry cell operation. The Crosley "Pup" appears to be the only radio factory-designed for the WD- or WX-12. The WD-11 and WX-12 were dropped from the official RCA product line in 1933 [4].

Those who want to play these early sets have a tube problem. RCA quit stocking WD-11 tubes 70 years ago. Today they are prohibitively expensive, being worth more than the radios using them. Because of their value, those who have WD-11s are reluctant to put them into service.

UX199s can be used per the RCA bulletin. Adapters are still around, but both are quite expensive. The 864 (VT-24), developed for aircraft

use, is a popular substitute because it has the same filament requirements and similar characteristics, but is also now quite expensive.

The Type 30 has been used as a substitute, but is both expensive and requires an oddball filament voltage. Another substitute is the Loctal 3D6, a beam pentode, connected as a triode and used with an adapter. Its filament requirements are similar to the WD-11. Miniature pentodes (1L4, 1S4, 3S4, 3Q4, 3V4) used in the same manner have also been described [5].

Another elegant solution is to use a miniature, wire-lead 5676 in a WD-11 base. A silvered test tube can be fastened over it over it to give the appearance of a WD-11.

Testing Possible Substitutes

I decided to carry out some tests on possible substitutes that would be cheap, plentiful, functional and resemble the WD-11. A look at the tube manual uncovered the following possibilities:

The first four tubes are shown for comparison purposes only. Types 1G4, 30 and 864 are not good candidates due to their high cost. The last

Tube	Fil. V/A	Bias V	Plate mA	Gm	μ	Base	Price-\$
WD-11	1.1/.25	4.5	2.8	400	5.6	Unique	100+
864	1.1/.25	-4.5	2.9	610	8.2	4-Pin	25-35
1G4	1.4/.05	-6.0	2.3	825	8.8	Octal	10-12
30	2.0/.06	-4.5	2.5	850	9.3	4-Pin	16-20
1LE3	1.4/.05	-3.0	1.3	760	14.5	Loctal	4-5
1Q5	1.4/.10	-4.5	5.8*	1075*	7.8*	Octal	3-4
1A5	1.4/.05	-4.5	5.6*	1070*	8.0*	Octal	3-4
1LA4	1.4/.05	-4.5	5.5*	1065*	8.1*	Loctal	4-6

* Triode-connected (screen tied to plate)

All values with $E_p = 90V$

three turned out to be good possibilities. Characteristics of the triode-connected 1Q5, 1A5 and 1LA4 are not listed in tube manuals and had to be measured. The 1Q5 is a beam power tube and the 1A5 a power pentode. The 1LA4 is a 1A5 with a

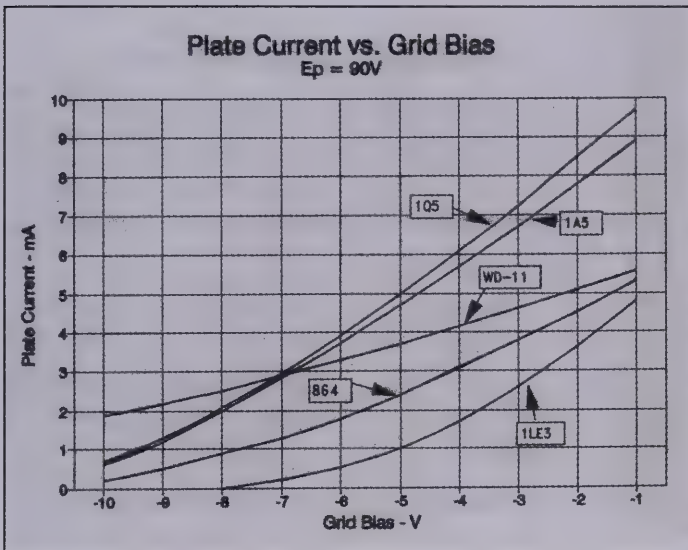


Fig. 1. Transfer characteristics of the WD-11, 864, and possible substitutes.

Loctal base. The characteristics of the other tubes were taken from the tube manual.

RCA recommends that the Radiola III-A be operated with 22.5V on the detector and 90V with -4.5V bias on the three amplifier tubes. Accordingly, the transfer characteristics of the WD-11, 864 and the possible substitutes were examined at $E_p = 90V$.

Fig. 1 shows the results. The WD-11, 1Q5 and 1A5 have long, linear transfer curves. The 864 and 1LE3 have a much narrower operating range. The steeper slope of the 1Q5 and 1A5/1LA4 reflect their higher transconductance. All the tubes have similar amplification factors (μ) except for the 1LE3 which is nearly twice that of the others.

Making a WD-11 Base Template

Because of the unique WD-11 base, substitutes must either be re-based or provided with adapters. Re-basing yields good looking results, but when it's time to replace the tube, you have to do everything all over again. Adapters are easier to make and use and involve less risk to the tubes. When the tube is worn out, just plug in a new one. There are some adapters sold commercially, but they are expensive.

You can make your own adapters at very little cost using old 4- or 5-pin bases from dud tubes. These should be the small, 1 1/8" diameter bases. It is easier to drill new holes in 4-pin bases, but 5-pin bases can also be used. A template will simplify your work.

The WD-11 pin layout is shown in Fig. 2. The template was made from a scrap of 1/4" thick Plexiglas about 2" square from the

local glass shop and a similar piece of Bakelite from an old radio panel. Lay out the pin locations on the Plexiglas as shown. Use a sharp scribe and be accurate. Drill one 3/16" hole and three 1/8" holes where indicated. If you spot the holes first with a center drill, the main drill will run true. A drill press is essential for precision. Also drill a 1/8" hole at the center of the pin circle for later use.

Now, clamp the Plexiglas and Bakelite pieces together and drill two holes near opposite corners for bolts to hold the two parts together. Bolt the parts together and, using the center hole as a guide, drill through the Bakelite with the 1/8" drill.

This hole in the Bakelite is the pilot hole for a 1 1/8" hole saw which you will next use to make a hole in the Bakelite to fit the tube base to be adapted. This hole may need a little filing or sanding to get a snug fit. Fig. 3 shows the template and Bakelite bolted together.

Making a WD-11 Base

Remove each of the existing pins on your tube base by holding it with pliers so it can't rotate and drilling away the flange from the inside. When the flange is removed, the pin will pull out easily. Use a drill of the correct diameter to remove the flange without removing any Bakelite. Scrape all the old cement out of the base. Insert the base into the template so the bottom is against the Plexiglas. You can now easily see

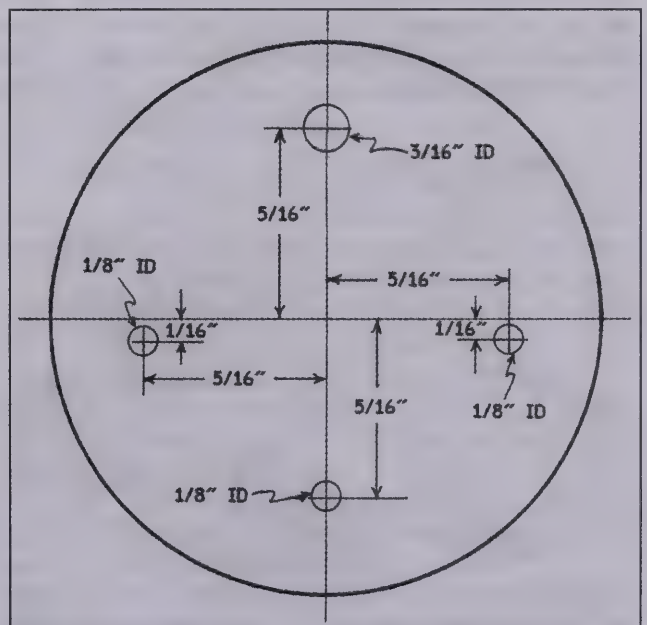


Fig. 2. Layout of drilling template for WD-11 base.

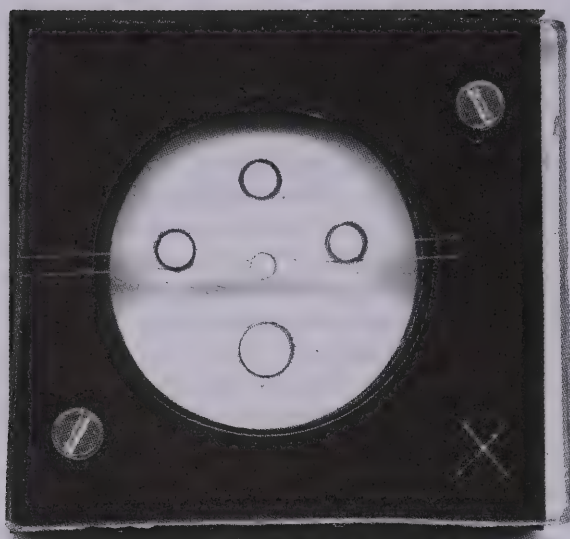


Fig. 3. Completed template assembly with Plexiglas and Bakelite pieces bolted together.

how to position the base so that the new holes will lie between the old holes.

Drill a $\frac{3}{16}$ " hole in the base using the hole in the template to guide it. Insert a small piece of $\frac{3}{16}$ " rod through both template and base to prevent slippage and drill the three $\frac{1}{8}$ " holes and one $\frac{3}{16}$ " hole. The new pins are made from thin-wall brass tubing in $\frac{3}{16}$ " and $\frac{1}{8}$ " diameters from a hobby shop. This tubing is full diameter, while the holes will be slightly undersize, therefore the new pins will fit tightly and need no anchoring.

Cut the tubing to $1\frac{3}{4}$ " length. I use a miniature tubing cutter from the hardware store. It gives a rolled edge at the cut which makes insertion and soldering easy. The best way to insert the pins in the base is to chuck them in your drill press and use the press to push them in. Make two $\frac{3}{16}$ "-long collars to use as depth gauges. Drill one to slip over the $\frac{3}{16}$ " pin and one to slip over the $\frac{1}{8}$ " pins.

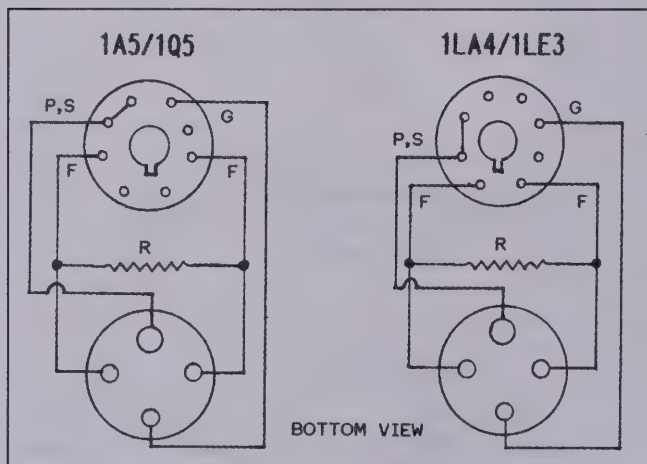


Fig. 4. Wiring diagrams for adapters. See text for function of resistor "R."

I made these from tubular spacers.

Start the brass tubing into the base by lightly tapping it with a small hammer. Then slip on the collar and press the tubing into the base until its end is flush with the end of the collar. Watch it closely to be sure it goes in straight. Now your pin will protrude the correct distance from the base.

Fabricating Adapters

The sockets I used to make adapters for the substitute tubes came from the junk box. They were the molded Bakelite kind with molded-in mounting plates. The diameter below the plate is about one inch so they fit snugly into the bases with just a little filing. Cut off the mounting ears with tin snips, but leave the rest of the mounting plate in place. Wiring of the adapter will depend on the type of tube you are using as a substitute. Diagrams for the 1LA4/1LE3 and 1A5/1Q5 are shown in Fig. 4. The resistor across the filament connections needs explanation.

Volume in these old sets is controlled by varying the filament voltage through a rheostat. It is sized for use with 0.25A tubes. Because the substitutes draw only 0.05 to 0.1A, the rheostat will have little effect on filament voltage and the set will run wide open with no volume control action.

For substitutes to behave like WD-11s, they must draw similar filament currents. The $\frac{1}{4}$ -watt resistor, R, shunting the filament increases the total circuit current to about that of a WD-11. This will give good volume control action. R should be 6.8Ω for the 1Q5 and 5.1Ω for all other tubes.

Connect the resistor between the filament lugs on the socket and solder wires to them and to the grid and plate lugs. The wires can be bare except the one from the plate (or grid depending on how you orient the socket with respect to the base). This wire needs to be insulated where it crosses over the socket. Guide the wires through the pins in your WD-11 base, seat the socket firmly in the base and solder the wires to the pins.

Drill two small holes on opposite sides of the base into the edge of the socket. Make sure that the holes go between socket pins. The diameter of the hole will depend on the size of the self-tapping screws you use to fasten the socket to the base. It is a good idea to experiment on some scrap Bakelite before drilling the sockets.

I use $\#0 \times \frac{1}{4}$ " or $\#1 \times \frac{1}{4}$ " screws. Using a larger drill, enlarge the hole in the base shell so that the screw passes freely. Do not drill into the hole in the socket edge. Insert the screws to hold the base and

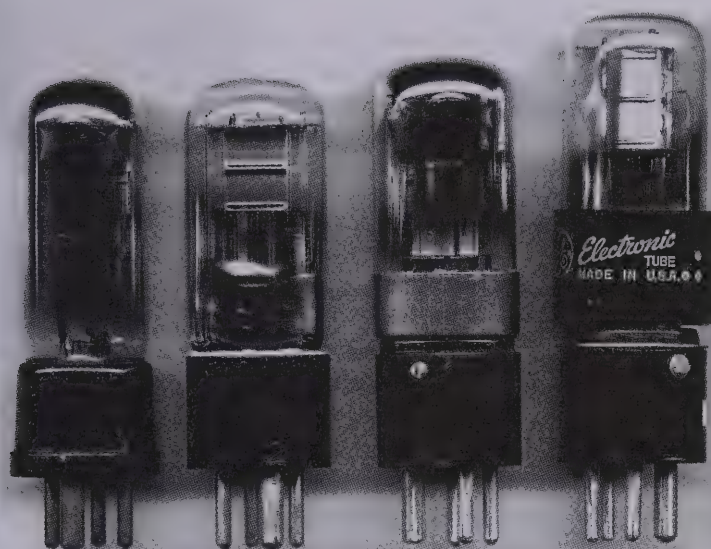


Fig. 5. From left: WD-11 tube; re-based 864; 1LE3 in its adapter; 1A5 in its adapter.

socket together. Don't overtighten them or you may crack the shell.

Fig. 5 shows (A) a WD-11 tube, (B) a re-based 864, (C) a 1LE3 in its adapter, and (D) a 1A5 in its adapter. The superficial resemblance of the substitutes to the WD-11 is obvious. Details of the adapter construction are also visible.

Testing the Substitutes

A Radiola III-A was equipped with WD-11 tubes and its operation studied. This set has 2 sections: a regenerative detector and an AF amplifier followed by a push-pull second audio output stage. There is provision for headphones after the first audio stage and each section has its own filament rheostat.

Because of the various interacting adjustments to be made for proper reception, there could be no "standard" setting for comparing tubes, so the test was subjective. In each case, a weak station was tuned in and the positions of the filament and regeneration controls noted at the settings for loudest volume and best sound quality. The position of the regeneration control at which oscillation occurred was also noted.

The set was operated with 22.5V on the detector and 90V on the audio amplifiers with -4.5V bias. The filament supply was 1.5V. A voltmeter was connected across the filament pins so as not to exceed 1.1V for the WD-11s. At first, only the "front" half of the set was operated (detector + first audio) with headphones.

Using WD-11s, the set was adjusted for best volume and sound. Then the WD-11s were replaced first with 1LE3s, then with 1A5s, and the set re-adjusted for optimum reception in each case.

You'll recall that the 1LA4 is electronically

identical with the 1A5.

The 1LE3s were rather touchy. Oscillation onset occurred at a much lower setting of the regeneration control and the filament control had to be reduced to avoid distortion. Nevertheless, performance was satisfactory and quality was acceptable. The volume was louder because of the higher μ of the 1LE3. The 1A5s also oscillated at a lower setting than WD-11s and required reduction of the filament voltage, but overall performance was much smoother than the 1LE3 and distortion was less at high volume.

A horn speaker was then connected to the second push-pull audio stage and the filament rheostat

turned on. There was a noticeable tendency for the 1LE3s to distort at high volume levels, but satisfactory room-level sound could be achieved with filament adjustment. As before, the 1A5s were smoother and more like WD-11s in operation. Distortion was less; room-level sound was easily achieved. In all cases, volume control action was as good as with WD-11s.

After similar tests were done with 1Q5s, it was found that there was little perceptible difference in the performance of 1A5s, 1Q5s and 1LA4s. In conclusion, I prefer the 1A5 or 1Q5 for a substitute. They are cheap and available and perform very much like the WD-11. The 1LA4 works just as well, but is a bit more expensive. If you happen to have some 1LE3s on hand, however, they are also functional and will do the job. ☐

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AMATEUR RADIO

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PLEASE INCLUDE SASE FOR REPLY.



2003 O.T. DX Contest Results

Great band conditions and lots of "visitors" to our contest

A total of thirty-two AWA stations sent in logs for this year's O.T. DX contest, making it the third most well attended AWA O.T. DX contest in the last six years. Notice I said "sent in" as opposed to the number of those who participated. Total participation was actually higher; some thirty-five AWA stations by actual count. Please remember to send in your logs so that you can be counted.

Fifties-era gear and homebrew circuits continue to be the mainstay of the event. Many of your letters speak of simple first rigs built in that special decade. Like you, I have many sharp, snapshot-like memories of the 50s that I will treasure forever.

To this day, I cannot smell melted solder without being instantly transported back to 1957. I was watching what must have been the smartest man on earth fix our television in the living room. He carefully took out several tubes and put them into a strange black box, twisted several knobs and with the air of a supreme court

judge pronounced them to be good, bad or the ominous "this one's about to go."

A few deft thrusts with a soldering iron and our TV (it was never called a television), my connection with Captain Kangaroo and the rest of the civilized world, sprang to life to the delight of my mother and I. In those days, TV repairmen were regarded as being on a par with Albert Einstein in intelligence.

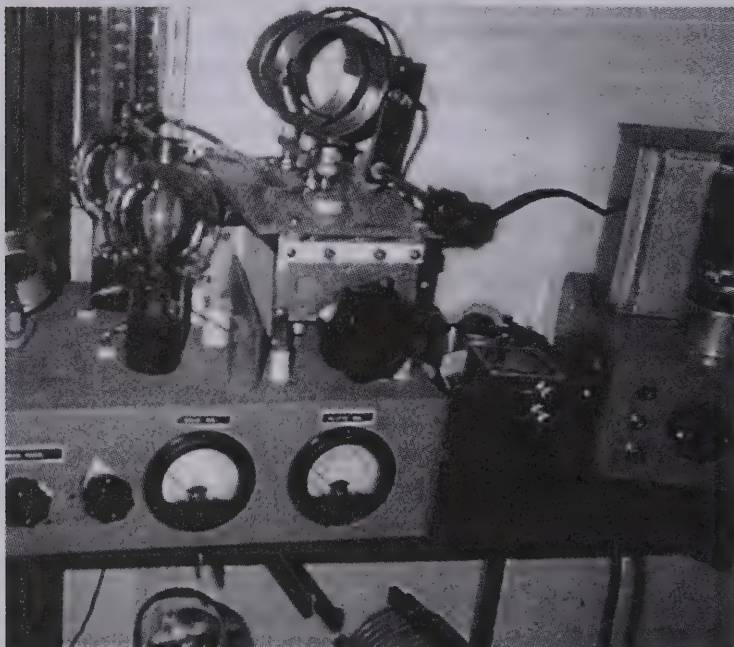
This event provides a great way to revisit the era of glass Coke bottles, Rambler station wagons and mothers who wore aprons.

Judging by your logs, the event went well, with relatively little QRM from major contests. Band conditions were noticeably better on the weekend. The logs show that many non-AWA stations stopped in to "see" what we were doing. Feel free to send these people AWA applications, which can be printed off of the internet. It is heartening to see several newcomers in the DX contest. Don Buska, N9OO wrote me a great letter (at least I now know I'm not the only one

with a cranky rig) as did Harold Borchers, KB0ROB and others.

Several of you asked about the power factor in computing scores. Power, as it is used in AWA contests, refers to your own input power to the transmitter final amplifier tube(s). This means that in the case of my 6L6 oscillator, I use thirty-five watts as my power rating (Volts X Amperes = Watts), even though I know I am only getting fifteen watts output to the antenna (no wisecracks, please). When using a modern rig, this is nearly impossible to determine, so just use your measured output to the antenna. The point is, have fun and don't worry too much about it.

As with the last two years' events, Sven Hed, SM4DIG held



K5RB ran about 175 watts to a pair of 808s on 80 and 40.

BY **RANDY HAUS, KB2PLW**, P.O. BOX 665, TRUMANSBURG, NY 14886

up the DX end of the contest, providing many contacts for the rest of us. Thanks Sven!

High scorer for the event was Parker Heine-
mann, W1YG of Lyme, Connecticut. Parker
amassed a whopping 384 points, which is unheard
of here in Podunk. (And yes, for those of you who

remember 50s era *QST* Field Day covers, it so
happens that I live five hundred yards north of the
real Podunk in upstate New York.) Parker used a
combination of gear, including a 1955 Collins
75A4. Congratulations on a job well done.

Here is a breakdown of the scores:

EASTERN ZONE

Station	Points	TX	RX
W1DDW	18	BC459	BC348N
K1FI	168	1948 Collins	1946 Collins
W1FPZ	102	1938 Homebrew	1950 HRO
W1GIG	48	1953 Elmac	1956 Hammarlund
W1NV	18	1970 Yaesu	1970 Yaesu
W1YG	384	1938 Meissner	1955 Collins
W2CQH	8	1984 Icom	1984 Icom
KB2E	12	1958 CE100V	1955 Hallicrafters
K2KK	36	1955 Johnson	1960 Hallicrafters
W2LID	17	Mod	Mod
KE2O	24	Mod	Mod
KB2PLW	104	1937 "Rollins H.B."	1943 BC348
W2VDX	45	1939 Homebrew	1946 Hammarlund
N2VO	54	1952 Homebrew	1952 Collins
KB3SI	10	Mod	Mod
W3VVS	2	Mod	Mod
WA3WMF	90	1954 Johnson	1956 Hammarlund
N4AWA	150	1955 Millen	1952 R390A
AA4RM	84	1957 Collins	1957 Collins
KJ8L	333	1954 CE10B	1953 Hammarlund
AA9DH	108	1948 Hallicrafters	1946 Hammarlund
N9OO	123	1953 Millen	1946 National
N9TT	6	1954 GlobeScout	1937 BC312
K9VKY	96	1955 Viking Ranger	1955 Collins
W9KV	24	Mod	Mod

WESTERN ZONE

Station	Points	TX	RX
K5RB	152	1953 Hallicrafters	National SW3
K6TQ	207	1938 6L6/807	1936 National HRO
W7DRA	36	1957 Globe Chief	1953 HRO
W7LNG	20	1955 Johnson Ranger	1959 Hammarlund
W8KGI/7	90	1951 32V3	1955 Collins
KB0ROB	294	1931 Homebrew	Mod Hallicrafters

DX ZONE

Station	Points	TX	RX
SM4DIG	216	1959 Hallicrafters	1938 HRO



THE COMMUNICATIONS RECEIVER

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PLEASE INCLUDE SASE FOR REPLY.



A World-War II National HRO

Introduction

In 1934 the National Company of Malden, MA created what was to become one of the most famous of communications receivers, the HRO. Introduced in October of 1934, it survived in one form or another for some 30 years, with who-knows how many thousands being manufactured and sold. For several years, and through several variations and modifications, they still bore a remarkable resemblance to the original. The HRO-W, which is the subject of this column, was one such.

So why the interest in just another HRO? Let's see if I can make the case. The -W model was designed in 1944, along with the HRO-5, to US Army Signal Corps JAN AWS (Joint Army Navy American War Specifications) specs. This particular set, Serial No. K329, has a label with a 1945 contract date and a Signal Corps acceptance stamp (SC7091P) located in three places: the cabinet outside, the chassis, and on one of the IF transformers.

The complete package consists of the receiver, a matched National #697 power supply, the nine matched coil sets in wood boxes, a loud-

speaker, and a manual. Uniquely, the original nine matched coil sets were still with the radio, as established by the K329 serial number stamped on each. The frequency range was a remarkable 50 kHz to 30 MHz, continuous coverage. While this was common practice with National military HROs, as for example the Navy RAS, what is unusual is finding the original complete set of coils with the receiver.

This is the first HRO-W model that the writer has seen in some 15 years of working with these sets. Perhaps not too many were produced, once it was established in 1945 that the war was almost over.

Another unique design feature of this radio is that it showed characteristics that were closer to the 1946 post-war HRO-5A than to previous non-military models. Noteworthy is the revised coil chart, consisting of a single engraved metal plate, which replaced the two individual chart frames with their paper charts and celluloid frames. Also, the coils were supplied without bandspread ranges (a feature typically for amateur operation) as this set was strictly for military use. It is probable that National, in gearing up for

the peacetime market, simply made a label change to the HRO-5 and -W sets, and marketed them as the HRO-5A in 1946. (A later version, the -5A1, had a noise limiter installed.)

The sub-chassis wiring and components were of a very high quality, no doubt due to the upgraded demands of the military after several years of using these radios under wartime conditions. After the wiring was complete, the chassis was subjected to the infamous anti-fungal protective spray treatment.

By agreement with the owner, the object of this re-



The complete HRO-W package described in the text.

pair/restoration was to make the radio work with as little modification as possible. It is deemed an interesting historical artifact, built to the highest standards of the day, and the decision was that it should be maintained that way so that future owners can benefit from inspecting an original item.

The Restoration Work

There was considerable storage debris inside the cabinet, so the shroud was removed and the chassis cleaned. The PW dial was very stiff, so the gearbox cap was removed and the old grease was replaced along with a liberal application of WD-40. At the same time the dial was disassembled and cleaned and the main knob was buffed to a high gloss with polishing compound and a cloth wheel. It was reassembled following the standard procedure for PW dials.

Usually the by-pass capacitors in a radio this old are bad, almost without exception. However, when I checked four of them, including the audio-coupling capacitor, all were found to be as good as modern high-quality units. Needless to say, I was delighted, as I saved several hours of work as well as honoring one of the goals of the job. Next, all tubes were checked on a military mutual-conductance (a TV-7/U) and all were found to be good. It appears they were all original items, as they carried the JAN designation. All shields and other original parts were in place; nothing was missing.

However, when the set was fired up with a good doghouse power supply (see "A Structured Approach to Fixing up Those Nice Old Radios" in this issue), the audio was terribly distorted. The fault was found to be in the cathode electrolytic for the 6SQ7 first audio tube, which was a dead short. To be safe, both of the set's cathode electrolytics were replaced, along with the first audio cathode resistor. The originals were disconnected and left in place.

Now all nine coil sets were checked to verify that the windings were intact and had not been blown out, as by a lightning surge. They were good, and were performance peaked at selected frequencies, one for each coil set. The owner was given instructions on how to make each coil set track across the dial. A surplus BC-221 or LM frequency can be used for this job (for all frequencies above 125 kc), but the procedure does involve considerable work and time.



A close-up of the label on the receiver.

The National speaker shown in the photo was somewhat "bassy" for communications work, although the owner reported he was quite pleased with it. A small modern communications speaker was adapted by mounting an output transformer inside, and it seemed to be easier to listen to. (NOTE: In contrast to the Navy RAS version of the HRO, the Signal Corps set followed the original design by incorporating the output transformer inside the speaker cabinet. If an HRO is used without this output transformer, the audio output tube must be removed to prevent burnout.)

Performance of the Restored Set

Typical of HRO receivers, this one is designed for use with a matched antenna system; a random short wire will not work very well at all. With the 6K7 front end, the sensitivity is about 3 μ V, not very good at all by today's standards. In fact, when comparing this with a cheap consumer radio of the period, the perception might be that the "cheapie" was more sensitive. In the absence of a good, tuned outdoor antenna system, the set might work better if an active antenna is used. If any reader has had experience along this line, we would like to hear of it.

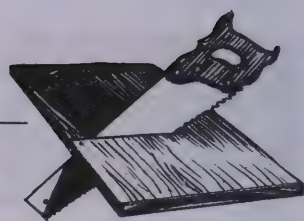
Another experiment might be to try improving the audio quality by feeding a hi-fi audio amplifier, from the headphone jack. (NOTE: If you do this, be sure to unplug the 6V6 audio output tube; without an audio output transformer, it will self-destruct.) We have not tried this as yet.

This particular radio was a rare find, essentially original and in excellent condition. And in spite of its obvious shortcomings, it is a quality communications receiver that should continue to work for years, essentially trouble-free. ☐

BREADBOARDING

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*Bring Historical Circuits to Life
On Your Workbench!*

Inverted Tubes

Looking through a stack of old radio magazines, I noticed the term “inverted connection” applied to a triode amplifier in which the input signal was applied to the cathode of the tube, while the grid was grounded. The output was taken from the plate “as usual,” so the circuit looked like that of figure 1.

We can easily breadboard this circuit — and when we do, we find that the tube current has to flow through the source impedance. Oooops! This could be a problem unless our source has a low resistance on its own, like a transformer winding or coil of some sort. In fact, the radio world found this circuit most useful at high frequencies, where the cathode could be driven by an RF inductor or tuned circuit.

Besides, the grid turns out to behave like a shield between input and output, killing off the tendency of the triode to misbehave by oscillating all the time. Amplifiers with grounded-grid input stages became known as “cascode” circuits, and were common in FM and TV tuners during the tube era. Equivalent circuits exist in the semiconductor world.

The gain of such an inverted circuit is usually expressed in terms of power gain, since some power has to be expended at the input. But for most triodes, one can expect a power gain on the order of 10 into an output load — not bad when frequency gets up there. You find these circuits in transmitters, as well. My 1964 *ARRL Handbook* shows a neat kilowatt grounded-grid amplifier that needs only 65 watts of drive (1).

But here’s another meaning to the term “inverted tube.” There came a time, while I was working on test gear for underwater mines, that I had to design a circuit to measure insulation resistance between lots of pairs of wires in certain cables. The Navy scientist who had written the specs knew how this job had always been done — with a “Megger”.

That was a kind of high-voltage ohmmeter that used a handcranked generator giving out about 500 volts. The idea was that such a voltage would break down insulation at any weakened spot, causing current to flow and moving a meter pointer. Problem was I couldn’t use a megger inside the hotstuff solid-state test box that my bosses had me developing. Yet the selection of wire pairs was being done by stepping switches!

Ah, the good old days. I went back to my textbook from college — a seventh edition of *Terman’s Radio Engineering*. That volume is long gone, but even in an earlier edition now on my desk I find the very brief passage that saved my job (2)

“... in an ordinary triode the functions of the grid and plate can be interchanged by making the grid the anode and by using the plate as the negative control electrode... in such an inverted tube, the negative plate affects the electrostatic field in the vicinity of the cathode and hence affects the anode current. However, since this control electrode is relatively well shielded from the cathode, the amplification factor is low, being approximately $1/\mu$, where μ is the amplification

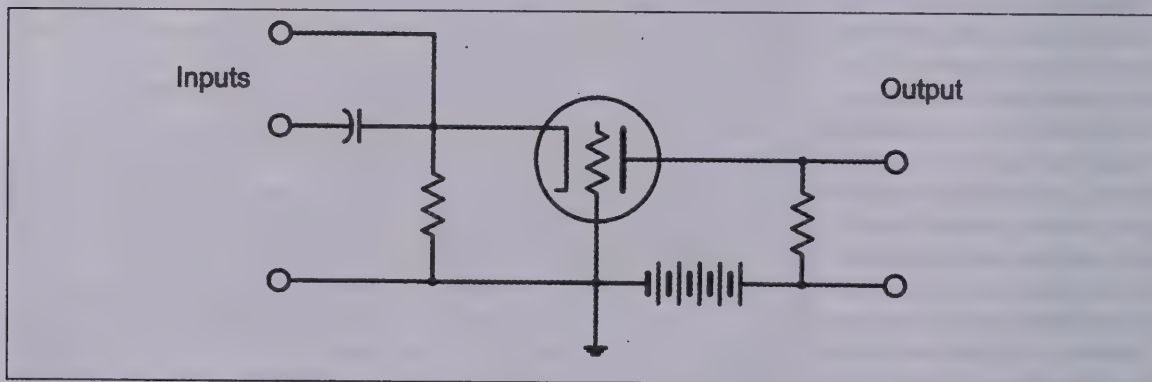


Figure 1. Grounded-Grid Amplifier (“Inverted Connection”)

factor of the tube operated as a triode in the normal manner. The inverted tube is a useful laboratory tool where it is necessary to control a current by a very high voltage without at the same time consuming energy from the high potential source."

Professor Terman had written a paper on this discovery in 1928 (3). I cribbed this circuit in the blink of an eye, and when I had debugged it, it looked like that of Figure 2.

The 7233 is really a 9-pin miniature low-voltage regulator tube — it looks like half of a 6AS7G. At the time I was wishing I could find a tube like that whose plate connection came out

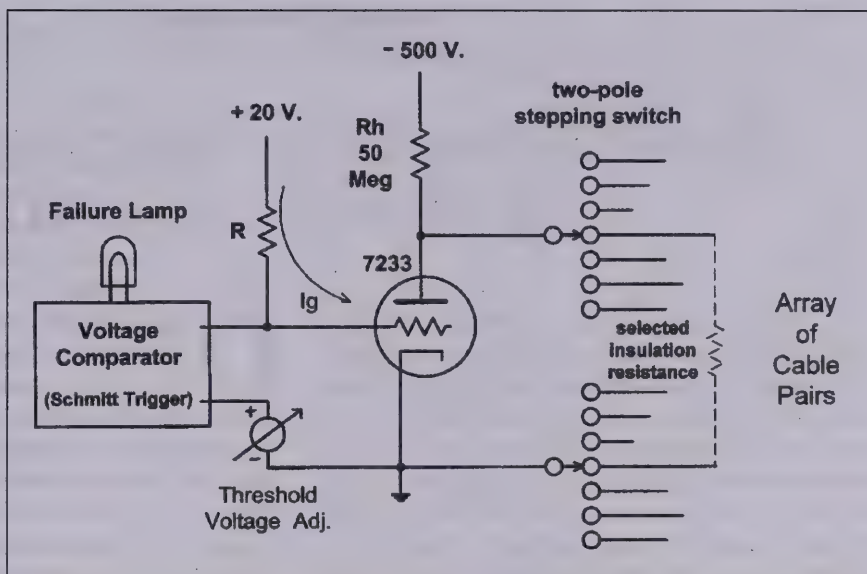


Figure 2. Type 2 Inverted Tube Circuit

the plate voltage to go more positive than -250, the field between plate and cathode got reduced enough to allow grid current to flow, and the grid voltage fell, triggering a level detector that lighted a light, indicating a failed insulation test.

I know, I know, it's not a radio circuit, but it used a tube! It stood out because it was the only tube in the whole box. When we took this to our design review with the Navy, someone pointed out the "reversed" voltages on the schematic, but I explained that we had used the well-known inverted connection, and there were no more questions.

The epilogue: I was walking down 9th Street in Washington one afternoon in 1980 when, passing a surplus store, I saw the exact same "Mine Test Set" that I had designed in 1964 on sale in the window at \$39.95. A great

bargain just for the stepping switches inside! ☺



Here's a photo of my one-tube Repro Audion receiver from last issue's column. The reproduction audion tubes are selling well, but there are a few left. You can contact me at dparks@erols.com

the top of the envelope; that would have given a very long leakage path from the "control electrode" to the rest of the circuitry.

The circuit worked like this: the 500 volt power supply fed the hot stepping switch arm through the high-value resistance Rh. As long as the resistance of the insulation path selected by the stepping switch arms was equal to or greater than Rh ohms, the plate of the 7233 would be more than 250 volts negative. That kept the grid of the tube from drawing current (Ig) across the load resistor R, and the grid voltage remained high.

But if the insulation broke down enough for

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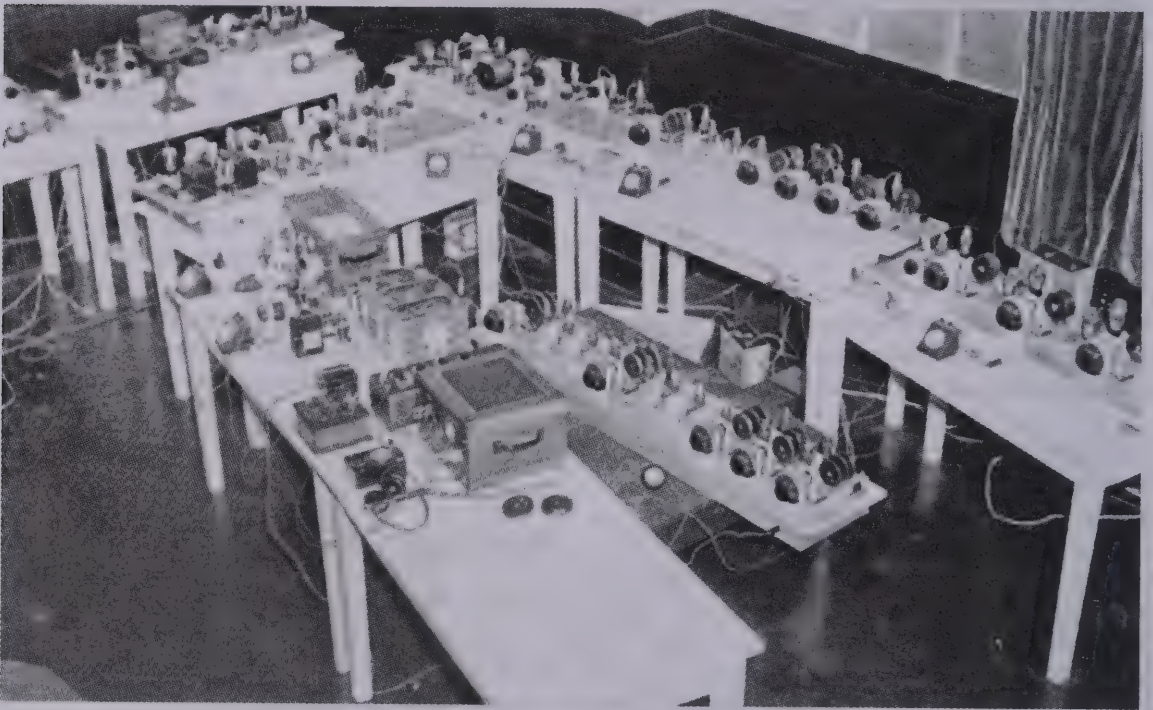
ARMSTRONG AND THE BIRTH OF FM BROADCASTING

The cover of our May issue carried a striking construction shot of Edwin Armstrong's Alpine, NJ experimental FM transmitting tower. It came from <http://users.erols.com/oldradio>, the remarkable web site of Mike Katzdorn, which is devoted to presenting a priceless collection of photos and graphics covering every phase of Armstrong's career. The materials were preserved by Harry Houck, Armstrong's long-time associate, and later entrusted by him to Mike.

Because of our upcoming conference's FM theme, I thought it would be a great idea if we could publish, in this issue, all of the material from Mike's site dealing with Armstrong's development of Frequency Modulation. Mike agreed, and was kind enough to rescan the pictures and graphics for us at the higher resolution required for printing. This is the result, and we hope you enjoy it! For more about Armstrong, be sure to visit the site itself.—mfe

During the late twenties and early thirties Edwin Armstrong spent a great deal of time studying natural and man-made static, becoming an expert on the subject. His goal was to devise a receiver that would do what nobody else had ever been able to do—eliminate the static. He soon discovered that the disturbances were almost always amplitude modulated. AM was used in all broadcasting at the time and there was no way to eliminate static without destroying or distorting the broadcast signal.

Engineers had been working with frequency modulated (FM) signals for a number of years, but always with narrow bandwidth. They found this mode very unsatisfactory for carrying any type of intelligence. In fact, it had been shown, mathematically, to be useless for broadcasting. Armstrong worked with narrow band FM for some time before giving up on it as so many had before. But instead of abandoning FM en-



Armstrong's FM exciter equipment set-up in the Empire State Building in early 1934.

tirely, Armstrong developed a new variation.

Between 1928 and 1933, Armstrong applied for the four basic patents on what would be his fourth great invention, wide band FM.

In accordance with his agreement to give RCA first right of refusal on future inventions, Armstrong demonstrated his wide band FM system, at Columbia University, to David Sarnoff and RCA engineers in late 1933 and early 1934. The quality was very good, but actual field testing would be necessary to convince the skeptical group that the system could work.

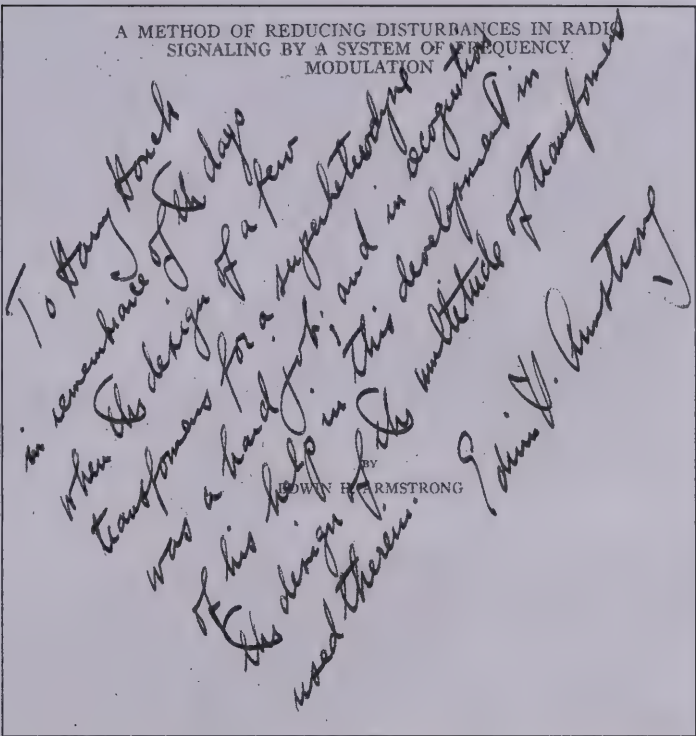
In 1931 NBC, the broadcasting arm of RCA, had installed a television transmitter on the 85th floor of the Empire State Building to conduct experiments with that new medium. By early January of 1934, not yet ready to start television testing, RCA had placed the transmitter at Armstrong's disposal to conduct large scale field tests of his FM system.

On November 5, 1935, before the New York section of the Institute of Radio Engineers, Armstrong presented his paper "A Method of Reducing Disturbances in Radio Signaling by a System of Frequency Modulation." His FM system was thus disclosed to the radio engineering community.

The presentation was accompanied by a demonstration of FM's capability, in which a transmission was received from Randy Runyon's amateur station in Yonkers. While the demonstration was a complete success, the engineering community, in general, was not enthusiastic.

Armstrong's FM tests at the Empire State Building would last from May of 1934 until October of 1935. The results obtained, on everything from microphones to antennas, would prove valuable to future FM development. It was clear to Armstrong that FM was far superior to AM. Surely RCA would jump at the chance to buy the rights to the fundamental patents on which FM depended.

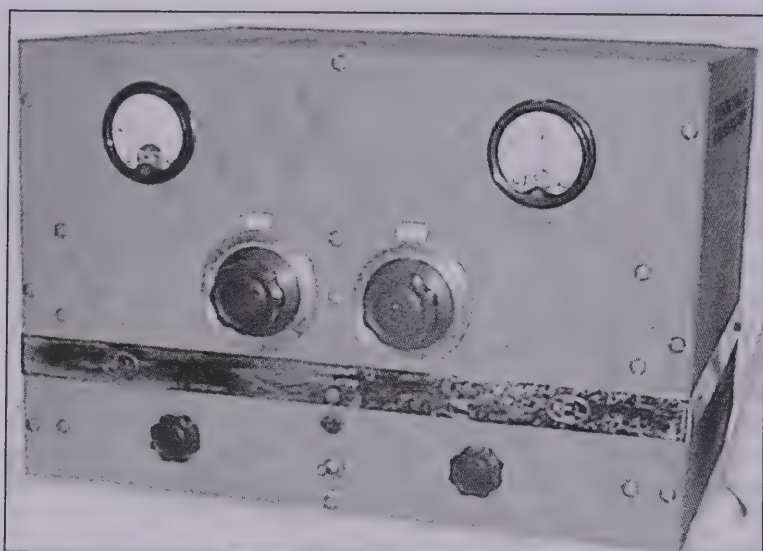
But as the 1930s dragged on, there



Reprint of Armstrong's epochal FM paper presented to Harry Houck by the inventor.



The transmitting tower at Alpine, N.J. under construction on November 10, 1937.



Front and interior views of the REL Model 517 receiver.

would be no offer from Sarnoff, only more delays as additional tests and more studies were called for. In fact FM was getting a cold shoulder from Sarnoff and RCA-aligned engineers. But why?

RCA would talk about the millions of receivers, and the hundreds of transmitters, which would be made obsolete by such a revolutionary system. They said the public did not want, and would not pay for, a completely new system, and FM would waste bandwidth and have a very limited service area. The receivers, they said, would be too complex and expensive for the ordinary listener.

But the real reason was clear. To paraphrase Sarnoff: "Television would replace the radio the way radio replaced the phonograph." All of RCA's research and development would go into

television. Armstrong became convinced he would have to prove the viability of FM himself.

Early in 1936, Armstrong cashed in a large block of RCA stock, netting about \$300,000.00, and undertook to build his own high-power experimental FM station. After listeners had tuned in on it, he was certain they would never return to AM.

An eleven-acre tract of land was purchased on the Palisades in Alpine, New Jersey. From this site he could look across the Hudson River at his boyhood home in Yonkers. From atop his future transmitting tower he would blanket Sarnoff's New York City with radio like no one had ever heard it before.

There would be one more obstacle to overcome—the FCC. Early in 1936 Armstrong applied for what should have been a routine experimental FM broadcasting license. It was denied as "a visionary development." It would not be until the end of 1936, and only after Armstrong threatened to take his invention out of the country, that the FCC issued a license and allocated a band just 3 MHz wide (41-44 MHz) to FM.

Late in 1937, as W2XMN was nearing completion, Armstrong ordered 25 FM receivers, at \$400.00 each, from General Electric. These receivers would be used to demonstrate FM in the New York area. They were the first production FM receivers, and the first FM receivers built outside of Armstrong's lab. G.E. would be the first company to obtain a license to manufacture FM receivers under the Armstrong patents, presenting Armstrong with his first FM royalty check for \$22.66 in December of 1937.

The audio chassis was designed to take advantage of FM's wide frequency response, using push-pull 6L6s working into a huge (for the time) output transformer. The receiver chassis was clearly first run; several types of pre-production GE tubes were used (e.g., XP332 and XP333).

In late 1938 the first commercial FM receiver, the REL Model 517, was produced. According to Frank Gunther, retired REL president, approximately 300 sets were manufactured (in 100 set runs). This set, weighing in at 45 pounds and selling for \$315.00, was of exceptional quality, and was primarily intended as an FM station monitor (40 to 44 mc).

However, the first two units off the production line went not to radio stations but to the FCC. According to Mr. Gunther, the FCC had been searching for a means to monitor the expected flood of new FM station licensees — and the Model 517 was perfect.

For Armstrong, the Second World War started in 1939, when the Signal Corps came to him for advice on adapting FM to mobile military communications. Through 1940 and 1941 he was proud to undertake a number of projects for the Signal Corps at no charge.

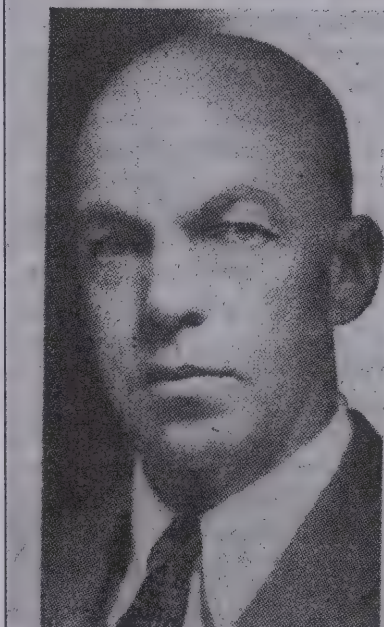
Armstrong's fortunes would soon change. With the cessation of all FM station construction and a halt to all non-military radio manufacturing, royalty payments dried up. Armstrong had spent over a million dollars on FM, but had received less than half that from royalties thus far.

In order to support his laboratories at Columbia and Alpine (with personnel now numbering 18), Armstrong took on a number of cost plus fee projects for the military. His primary contribution, although not completed by the end of hostilities, was a complete FM radar system capable of very long range detection.

In 1945 the FCC dealt Armstrong a blow. To make way for television, FM would have to move from the established 44 - 50 MHz pre-war band to a new
(continued on page 46)

Maj. Armstrong Leaps to Death; FM Inventor, 63

Note Blames Estrangement

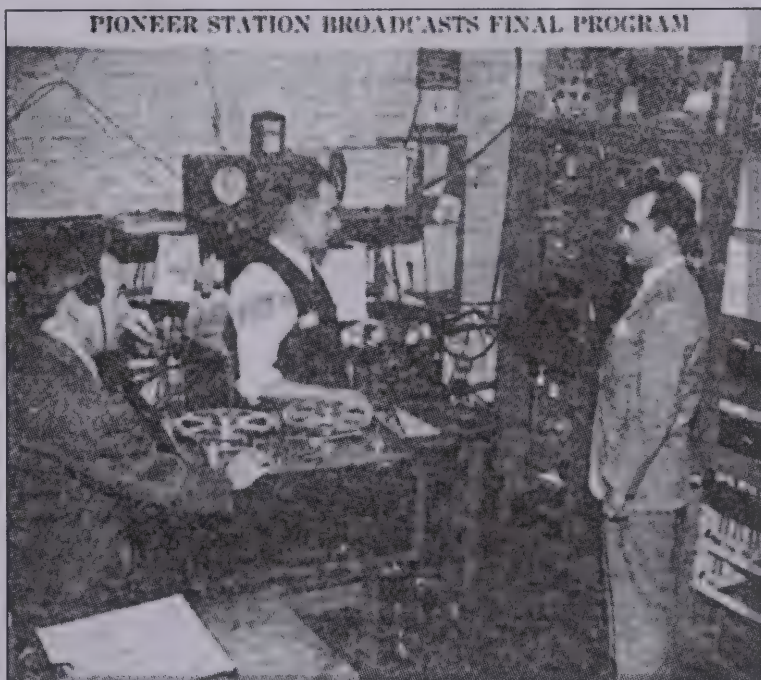


Maj. Edwin Howard Armstrong, 63, the electronics genius who invented FM radio, leaped to his death today from his 13th-floor apartment at River House, 435 E. 52nd St.

A note found by the police in the empty Armstrong apartment indicated that Maj. Armstrong had sought death because of a recent estrangement from his wife, Mrs. Esther Marion Armstrong, now visiting a sister in Granby, Conn.

Maj. Armstrong, professor of electrical engineering at Columbia University, who won the Medal of Merit and a Presidential citation for his contribution to military communications by

The shocking news as reported on February 1, 1954.



The Armstrong station's final broadcast, a memorial to the inventor, aired on March 6, 1954. Armstrong's close friend Jerry B. Mintner (far left) assisted.

LICENSED COMMERCIAL RADIO OPERATORS: THE FORGOTTEN MEN OF RADIO

Licensed commercial radio operators played an important role in the history of radio. They served as radio operators on ships, at commercial radio and television stations, as technicians working on two-way radio equipment, and in other similar activities.

The difficulty of becoming licensed has never been fully appreciated. It required a great deal of study, hard work, and passing a formal, federal examination. It was not an easy task, and many failed the examination the first time they took it.

Licensing

The licensing of commercial radio operators began in the early 1900s in response to the facts that radio frequencies constitute a scarce, shared resource and the operation of radio equipment involves issues of public safety.

The licensing requirements evolved over time to reflect changes in radio technology. By the 1950s, these requirements had reached their final form. By the 1980s, the era of licensing deregulation had begun. Arguably, the 1950s were the glory days for the cadre of commercial radio operators who had worked so hard to become licensed.

In the 1950s, there were two main categories of licenses for commercial radio operators - radiotelephone and radiotelegraph. Both categories had classes that ranged from First to Third. The term "operator's license" was somewhat misleading, since the licensees were also required to install and maintain radio equipment.

The radiotelephone licenses were the most widely held. A First Class Radiotelephone

Operator's license was required to operate and maintain commercial broadcast radio and television transmitters. A Second Class Radiotelephone Operator's license was needed to service commercial two-radio equipment. To work as a radio operator on a commercial ship required a First or Second Class Radiotelegraph Operator's license.

A Ship Radar endorsement was available for the First and Second Class Radiotelephone or Radiotelegraph Operator's license. There was also an Aircraft Radiotelegraph endorsement, though that had little value in the job market in the 1950s. The Third Class Radiotelephone and Radiotelegraph Operator's licenses were also of minimal value in the job market but often served as a starting point for obtaining a more advanced license.

Preparing for the Examination

Each license required passing a number of examination elements. The Federal Communications Commission (FCC) published sample questions, sometimes numbering in the hundreds, for the individual elements. The questions involved both basic radio law and advanced radio theory. Some involved solving mathematical problems

COMMERCIAL RADIO LICENSES IN THE 1950S		
License Class	Examination Elements	Morse Exam
First Class Radiotelephone	I, II, III, IV	None
Second Class Radiotelephone	I, II, III	None
Third Class Radiotelephone	I, II	None
First Class Radiotelegraph	I, II, V, VI	25 WPM
Second Class Radiotelegraph	I, II, V, VI	20 WPM
Third Class Radiotelegraph	I, II, V	15 WPM
Aircraft Radiotelegraph endorsement	VII	25 WPM
Ship radar endorsement	VIII	None

NUMBER OF SAMPLE QUESTIONS PER ELEMENT

Examination Element	Number
I	33
II	53
III	537
IV	284
V	38
VI	895
VII	266
VIII	69

related to radio and electronics.

Though representative of what might be on the exam, the sample questions were not the exact ones that would appear. So it was important to understand the general principles on which each sample question was based. Study guides were available that listed both the sample questions and appropriate answers. One of the more popular ones was *The Radio Operator's License Q & A Manual* by Milton Kaufman. The Kaufman manual also contained discussion material further explaining the answers.

The Q&A books were fine for people who already had a technical background in radio. People who perhaps had attended a commercial or military radio and electronics school, or who had experience as an amateur radio operator. Those who lacked that basic knowledge needed more than a Q&A book.

In the 1950s, there were proprietary technical schools that provided training in radio and electronics. They also prepared their students to take the FCC exams to become licensed commercial radio opera-

tors. Examples of these schools included the RCA Technical Institute and Port Arthur College. These schools required full time attendance for approximately 18 to 24 months.

Though some of these schools called themselves "colleges," they were usually not degree granting institutions. Rather they issued diplomas or certificates of completion. Helping students prepare to pass the test for a commercial radio operator's license was the real goal.

For those who could not attend formal classes, there were schools that offered training via correspondence. Perhaps the best know of these schools in the 1950s was the Cleveland Institute of Electronics. Its courses took beginners from basic electricity through advanced radio and electronics in preparation for passing the FCC exams. One of the school's more popular courses was specifically geared toward preparing students to pass the First Class Radiotelephone exam.

The Examination

The license examination had to be taken in person at an FCC office. In some major cities,

EXAMPLES OF SAMPLE QUESTIONS

Element I. Is the holder of a radiotelephone third-class operator permit authorized to make technical adjustments to the transmitter he operates?

Element II. If a station is required by law to listen on a calling and distress frequency, when may the listening be discontinued?

Element III. What circuit and electron tube factors influence the voltage gain of a triode audio-frequency amplifier stage?

Element IV. What is the reactance of a condenser at the frequency of 1200 kilocycles if its reactance is 300 ohms at 680 kilocycles?

Element V. Code or cipher groups are often used in radiotelegraph messages for what purposes?

Element VI. What capacity of storage battery is required to operate a 50-watt emergency transmitter for six hours, assuming a continuous load of the transmitter of 70 percent of the key-locked demand of 40 amperes? The emergency light load is 1.5 amperes.

Element VII. With reference to ground direction finder stations, what is the principal advantage of the ADCOCK station over the early loop direction finder stations?

Element VIII. What is the purpose of an echo box in a radar system?

like Atlanta and Detroit, the examinations might be given on a weekly basis. In other cities, like Cleveland and Pittsburgh, examinations were given only on a quarterly basis. Taking an examination would usually involve missing time from work or school. It might also require getting up at 5 a. m. to make the trip to the examination office.

Those aspiring to qualify for a First Class Radiotelephone Operator's license, usually began by passing the exam for the Second Class license. A second trip to the FCC office would be made to pass the final element required for First Class status. Though it was possible to take the entire First Class examination at one sitting, only a few hardy people did it.

Besides answering questions on law and theory, those seeking Radiotelegraph Operator's licenses had demonstrate their capability of sending and receiving Morse code. Applicants had to pass the code proficiency test before being allowed to take the written examination.

The written examinations were all "closed-book" and multiple choice. The use of slide rules was permitted, to help in solving solve the mathematical problems. Time limits were enforced. An examination started in the morning had to be finished by the noon lunch break. An examina-

tion started after lunch had to be completed by the end of the business day.

Unfortunately, many people failed an examination on their first attempt. Therefore, additional study and repeat visits to the examination office would be required. Passing these examinations was a major achievement.

In the 1950s, the FCC issued impressive looking Commercial Radio Operator's license certificates which reflected the hard work that went into passing the examination. At commercial radio and television stations, the employees' operator's licenses would be proudly displayed in a large glass frame on the wall.

End of an Era

In the 1980s, the commercial radio and television industry was deregulated and the First Class Commercial Radiotelephone Operator's license was eliminated. This significantly affected the requirement for licensed commercial radio operators. Then in the 1990s, the requirement for licensed commercial radiotelegraph operators on commercial ships was eliminated.

Today, there is still limited licensing of commercial radio operators but the glory days are long gone and all that remains are the fond memories of an era that will never return. 

ARMSTRONG, continued from page 43

band at 88 - 108 MHz. More than half a million FM receivers and some 50 transmitting stations would be rendered obsolete. But the worse fear for Armstrong would be a loss of confidence in FM by the growing number of faithful hi-fi listeners.

This move to higher frequencies, however, proved to be only a temporary setback. By 1950 there were over 600 FM stations on the air and Armstrong had collected close to \$2,000,000.00 in FM receiver royalties. The problem, though, was the personal cost of keeping his Alpine station on the air and funding his research and staff. The money was leaving as quickly as it came in.

The fact was that though many companies were paying FM royalties (G.E., Westinghouse, Zenith and Stromberg-Carlson, to name a few), R.C.A. and its licensees were not. Armstrong needed that income to continue his independent research and remain free of corporate control.

On July 22, 1948, Armstrong instituted a suit against R.C.A. and N.B.C. charging them with infringing his five basic FM patents. This suit

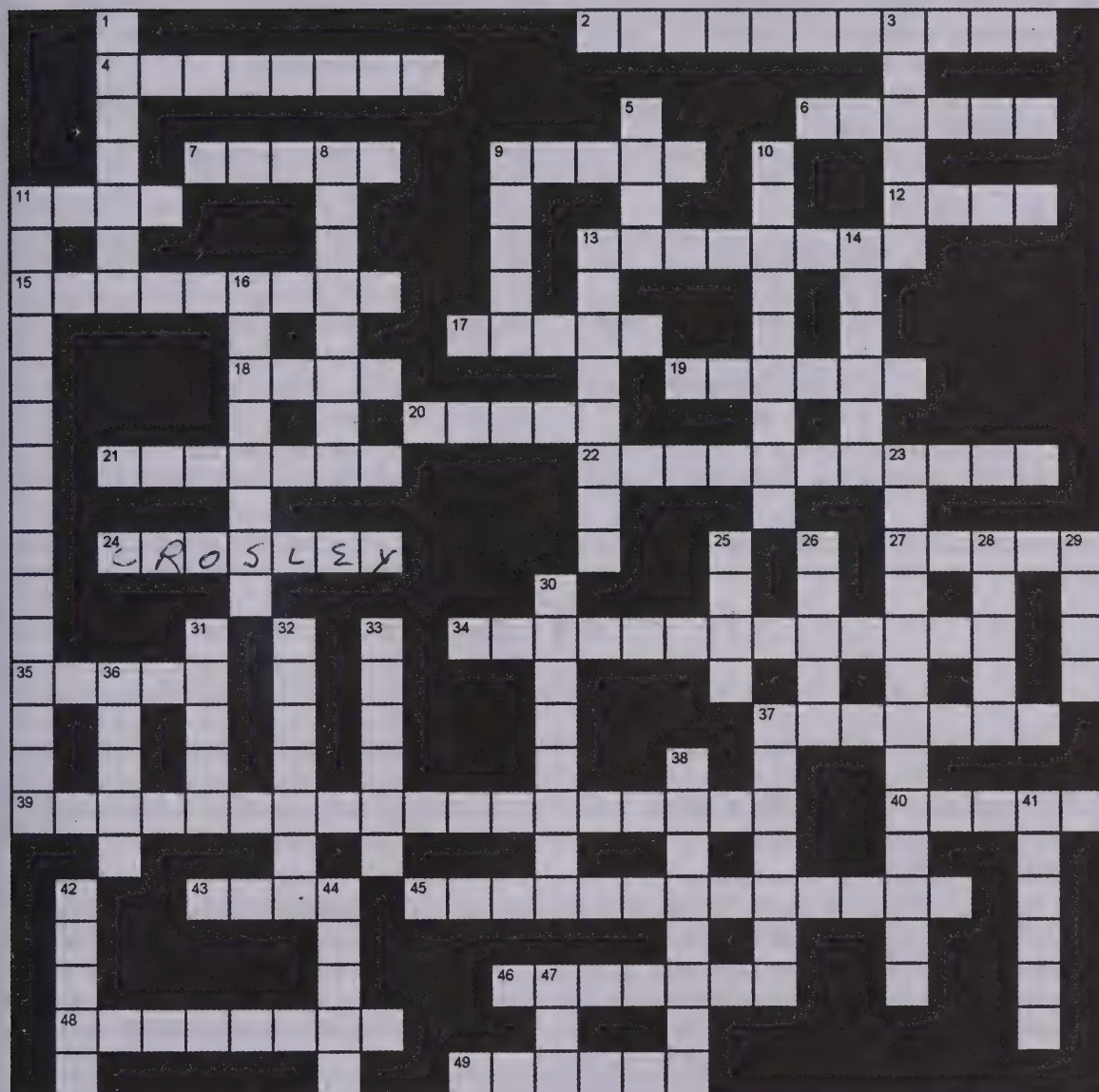
would virtually dominate his life — and in fact would outlast him. In November of 1953 it must have seemed to Armstrong that the world was closing in on him. Marion, his wife of 31 years, could not cope with this final war in the courts and his worsening personality, she left him for her sister's home in Connecticut. It was only later realized what dreadful condition his finances were in. He was facing a real catastrophe.

On February 1, 1954 the depressed Armstrong jumped to his death from his 13th floor apartment on New York City's 52nd St. In a two-page note to his wife, left in the apartment, Armstrong expressed his love for her and blamed their estrangement for his suicide. The station at Alpine remained on the air for awhile but broadcast its last program, a half-hour tribute to the inventor, on March 6th. The program ended with the playing of the Star Spangled Banner and a final announcement: "As we prepare to pull the switch and shut the station down, we salute the memory of Edwin Howard Armstrong." 

BY DAVID W. KRAEUTER

RADIO MANUFACTURERS OF THE 1920S

(With apologies to Alan Douglas)



ACROSS

2. Like warm iodine.
4. The ___ cometh (sort of).
6. In Ohio, appropriately.
7. Couldn't fly a plane if it had to.
9. Good it wasn't called the "Blatterman".

11. Rhymes with "tear" but not with "tear".
12. Were they at the top?
13. Ms. Fergus' baby.
15. Literally, broken village.
17. The whole town's talking about his boy.
18. Did this radio have a

- reception problem?
19. His first name was austin, but Sams' was ____.
20. Balderdash (sort of).
21. Athenian it wasn't.
22. Mastered voice, too (run together).
24. Not even remotely related

AUTHOR'S ADDRESS: 506 E. WHEELING ST., WASHINGTON, PA, 15301

- to Bing.
27. Their motto: King of the Air.
 34. It could have been Glenn-Frederick (run together).
 35. Had nothing to do with walruses.
 37. Conflate Klicpera and Blitzen.
 39. It could have been Fulton&Bowden (run together).
 40. No doubt where it was made.
 43. Leader of a cause or a nation.
 45. Refrigerators did it (loosely speaking).
 46. Part of electricity, but not electronics.
 48. Sometimes confused with J. J.
 49. This Indiana Lavern had no Shirley.

DOWN

1. Nevertheless, not made in DC.
3. Could also move air at night.
5. Unlike some AKs, their radios each had one.
8. The obvious choice for Wagnerites.
9. Probably worked in the country, too.
10. ___-Balke-Collender.
11. Did their sales slump in the east? (run together).

13. Often seen on campus.
14. Mountain range (sort of).
16. From the woods (run together).
23. The ___-___ Speedometer Corp.
25. Superman.
26. Do not confuse with a camera maker.
28. This one couldn't fly, either
29. Aka Electrical Research Laboratories.
30. The name promised proper operation.
31. Borgnine's 1955 movie character spelled his name differently.
32. Were their radios a model of perfection?
33. Hair style.
36. He wrote: "Breathes There the Man with Soul So Dead..."
37. Also an American senator.
38. What would Fred W. Stein call his radio?
41. All radios use it.
42. Did *not* make Litz wire.
44. Mr. Gardner's and Mr. Rodman's baby.
47. Mr. Sarnoff's baby.

See Answer Key on page 61

[Originally published in The Pittsburgh Oscillator, June 2003, pp. 6-8.]

SILENT KEYS

We record the passing of the following AWA members with deep regret.

PAUL H. DESVEAUX, WB1HBX, 77, (4-21-03) was a foreman for Lane Construction Company. During WWII he was a Radioman on the USS Biscayne, but was later transferred to the US Naval Communication Station NPM in Hawaii where he was assigned to the Receiver Room to copy code. Desveaux was a cofounder of the Maine Potato Net on 75 meters and acted as Net Control Station for many years.

ALTON A. (ANDY) DUBOIS JR., 84, (4-10-03) was a frequent contributor to *The OTB*. During WW II he served in the 777th Railway Operating Battalion, which operated the Trans-Iranian Railroad (1942-1945). He retired from RCA Service Co. in 1981 after 32 years of service. As President of Tower Clock Chapter 134 of the National Association of Watch and Clock Collectors, he participated in documenting and restoring numerous large clocks in public buildings and churches.

EDWARD S. KRAWCZYK, (75) was an electronic technician at the ITT Laboratory in Nutley, NJ where he repaired and calibrated test equipment. After retirement he became the owner of Electronic Clinic in Saddle Brook, NJ. His article, "The Colonial 'Globe' Radio", was published in *Antique Radio Classified* (September 2000).

EDWIN C. KUBES, 86, (2-22-03) was a retired laboratory technician who enjoyed restoring antique radio and electronic equipment. He lived in De Bary, FL.

PETER W. STUTMAN lived in Montreal, PQ, Canada.

Note: AWA officers and members are being asked to submit all information about Silent Keys to Joyce Peckham, Box E, Breesport, NY 14816. This will help in the collection and coordination of information and appropriate recognition of both AWA members and others who have made contributions to the electronics and entertainment industries.



The Receiving Loop Antenna

In this article we will briefly explore the classical loop antenna, that is the receiving loop common to the period from before WWI to the late 1950s. If you look in the back of your 1930s through 1950s table radio, you are likely to see one mounted on the cardboard or Masonite rear cover—or even wound inside a wood-cased radio using the cabinet as a supporting frame. You may even own a pre-1930s vintage receiver where the loop is separate from the receiver's main chassis (Figure 1).

Before we start our discussion, we should quickly review a few significant physical characteristics of the classical receiving loop antenna. The receiving loop we are talking about is a small, multiple turn coil with the plane of the coil perpendicular to the horizontal. The intention is to have a coil of wire where the magnitude of the received RF current has constant amplitude throughout the length of the coil. This antenna's physical size is usually in the order of a few hundredths of the wavelength at most. Other loop designs include the single vertical loop, the multiple vertical loop quad and quagi variants (Figure 2), and the horizontal loop. In these designs, the loop perimeter is customarily about one wavelength at the lowest operating frequency and each loop consists of only one turn. The magnitude of the current along the length of the wire within the large loop antennas alternates between loops (maximum) and nodes (minimum).

The loop antenna's shape, whatever the design, is usually square. However good-performing loops can be constructed as triangles, rectangles, and regular or irregular polygons. At SHF, i.e. 1296 MHz, the loops are typically circular for strength and ease of construction.

The receiving loop antenna is considered to be a negative gain antenna. That is, its gain is significantly less than the gain of a full sized dipole or full sized loop. The reason is obvious, the cross sectional area, i.e. the energy capture area, is very small compared to the full sized loop. Additionally, the "radiation impedance" of a

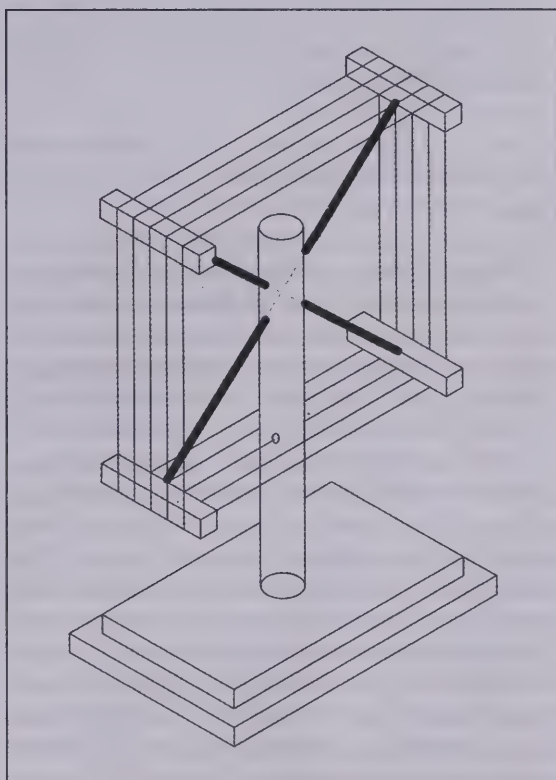


Fig. 1. Classical receiving-type loop antenna.

small receiving loop is usually very small compared to the loop's ohmic and RF loss resistance. In comparison, the radiation impedance of a large loop antenna, i.e. two-element quad, is in the order of 60 to 100 ohms, while the loss resistance is only a few ohms.

If an amplifier with adequate gain is used, the signal loss of the receiving loop antenna can be overcome. If the small receiving loop is properly designed and installed in its environment, the antenna will have a reliable directional characteristic with very deep nulls between the lobes. The directional characteristic has been exploited in radio direction finders and receiving antennas intended to minimize co- and adjacent-channel interference. Classical-design receiving loops can be built for frequencies ranging from a few 10s of kilohertz to a few 10s of megahertz.

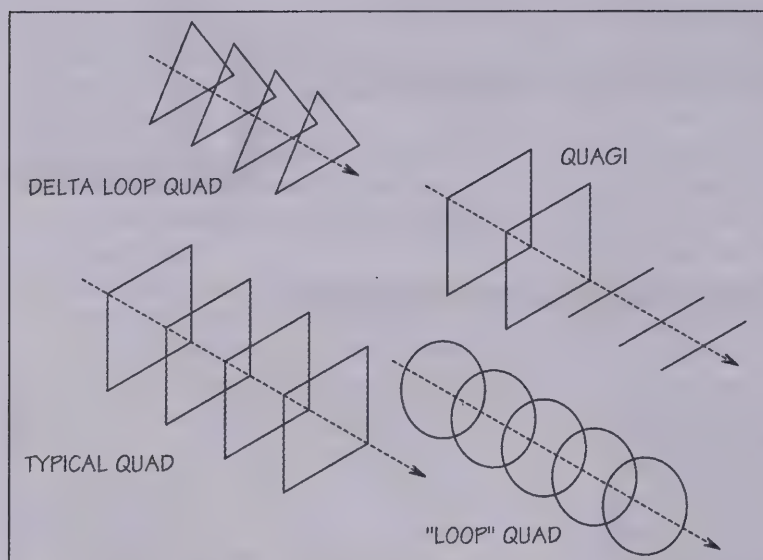


Fig. 2. Various types of loop antennas.

Figure 3 illustrates the idealized figure 8 directional characteristics of the small receiving loop. In the real world this pattern can be closely approached if the loop has electrical balance, or *symmetry*, and is installed in an environment adequately removed from conductive structures.

The plane of the receiving loop is perpendicular to the earth's surface, and the maximum signal sensitivity is realized when the plane is positioned in line with the transmitted signal. The plane of the quad and quad variants is also perpendicular to the earth's surface. However, maximum signal sensitivity is realized when the plane directly faces the transmitted signal. The plane of the horizontal loop is parallel to the earth's surface. This design exhibits little if any directional characteristics when the wavelengths of the received signal and loop perimeter are similar.

Figure 4 illustrates poor and good designs for electrical balance. The small receiving loop is supposed to respond to the received signal's magnetic field. When there is electrical imbalance, symmetry is lost and the loop also responds to the received signal's electric field. The result is a distortion of the figure 8 pattern with a deterioration of the depth of the nulls between the two lobes.

Figure 5 illustrates an antenna pattern that may be a result of poor electrical balance, and/or the lack of symmetry of the area surrounding the loop's installation. Obviously, electrical balance is not very important for home radio receivers. However, electrical balance for radio direction finding and interference rejecting antenna designs is *very* important.

The basic relationship for the design of a receiving loop antenna is given by:

$E = 1.414\pi f N A H$ (ref.1)
 where: E = the effective emf (voltage induced in the loop)
 N = the number of turns in the loop
 A = is the area of the loop
 H = the transmission's field intensity
 f = the received (mean) frequency

For example, if you want more output from the loop:

- Move closer to the transmitter (H increases).
- Use more turns (N increases).
- Make the loop physically larger (A increases).
- Ask the transmitting station to use a higher frequency (f increases).

However, for a number of reasons you can not increase all the above factors without limit. Increasing loop area or number of turns cause a desirable increase in loop inductance, but as these parameters are increased, so do the loop's loss resistance and distributed capacity. This may negate the effects of the desired increase in inductance. Of course, transmitter frequency and power are generally not under the control of the receiving station.

Ultimately, the name of the game is to design a loop where:

1. The operating frequency is between one third and one half the loop's natural resonant frequency, with the loop tuned to the operating frequency by a low loss series variable capacitor.
2. The loop has the largest area with the least

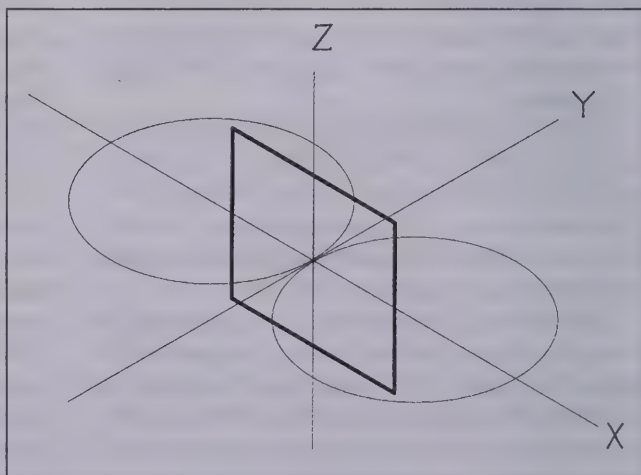


Fig. 3. Loop antenna figure 8 pattern.

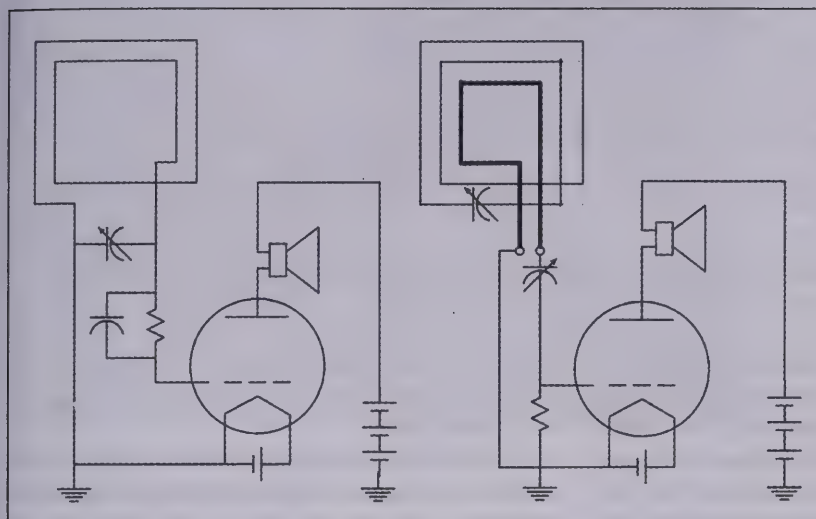


Fig. 4. Poor (left) and good designs for electrical balance.

number of turns.

3. The size of the loop is kept small compared to the received wavelength.

4. The materials used and the turn-to-turn spacing are chosen to minimize dielectric and skin effect losses as well as and distributed capacitance between the turns.

5. If the loop is inductively coupled to the receiver, the coupling is well to the shy side of critical coupling.

Typically, the classical receiving loop was wound from "Litz" wire¹ for the higher-performance radio direction finding and interference-rejecting designs, and from solid or stranded wire for low-cost table-model radios. The frame of the higher-performance designs was constructed of turned hardwoods, where the amount of wood was minimized to lower dielectric losses. For maritime applications, the loop had to be protected from corrosion by housing it in a sturdy enclosure with low r.f. losses.

Morecroft (ref 2) suggests the following de-

¹ Litz (Litzendraht) wire is made from individual fine insulated wires that are interwoven into a braided cable. For RF applications to about 500 kHz, it has been shown that this cable has significantly lower RF loss than solid or stranded wire having the same total cross sectional area. Litz wire is available from a few domestic and overseas sources.

sign parameters for receiving-type square loops:

- For 600 meters (500 kHz), 10 turns with 1.2 meters (~48") on a side.
- For 10,000 to 20,000 meters (30 kHz down to 15 kHz), 50 turns, with a turn spacing of 4 centimeters (~1.6"), and 6 meters (~19 1/2') on a side.

One might wonder if the receiving loop be used as a transmitting antenna. Yes indeed! Given a choice, a larger more full sized antenna will very likely be the more efficient radiator, including at LF. Yet space

and legislative restrictions may make the transmitting loop antenna a more desirable option (ref 3).

In a future article we will review the basics of one of the receiving loop's most important applications, "radio direction finding." 

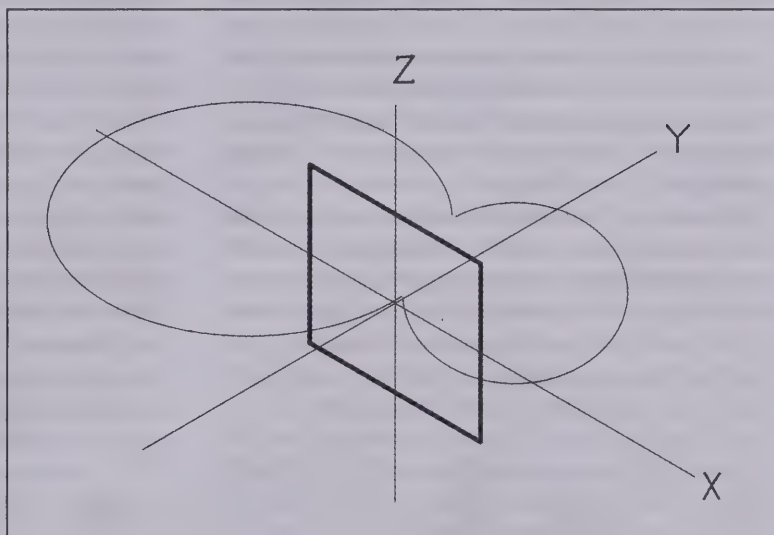


Fig. 5. Distorted loop antenna pattern.

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A STRUCTURED APPROACH TO FIXING UP THOSE NICE OLD RADIOS

Restoring a Power Supply — The National #697 “Doghouse”

In reworking any old AC-powered radio from the 1930s and 40s, almost the first task to be accomplished is to be sure that the power supply is working. I say almost, since no circuit restoration work should be attempted before you have completely evaluated the set, done the necessary cleaning, determined its general state of repair, located the diagram, and established whether you actually do want to take on the job of redoing all the electronics.

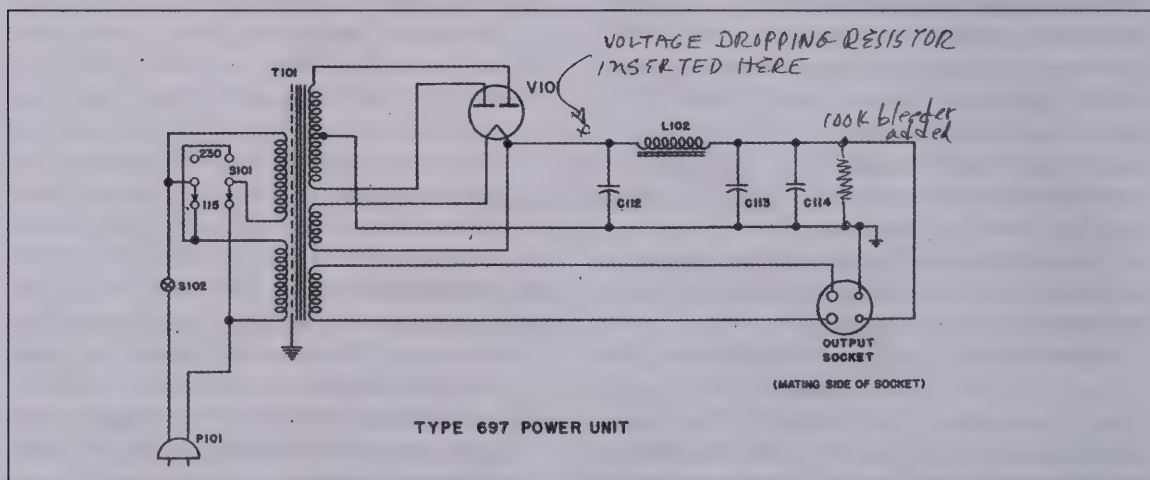
Since this is a column directed at the novice radio restorer, those of you who are conversant with reworking AC power supplies in old radios need read no further. But to the beginners I need to emphasize the absolute need to be sure that you have the B+ circuits free of shorts, and that the power supply is working properly. Let's take a look at the situation in general and at one particular power supply that ended up on my bench recently.

Hopefully your resistance checks on the B+ lines are consistent with the diagram, and the power transformer shows no signs of abuse, such as leaking tar or a burned smell. You have determined that the circuit has continuity through the

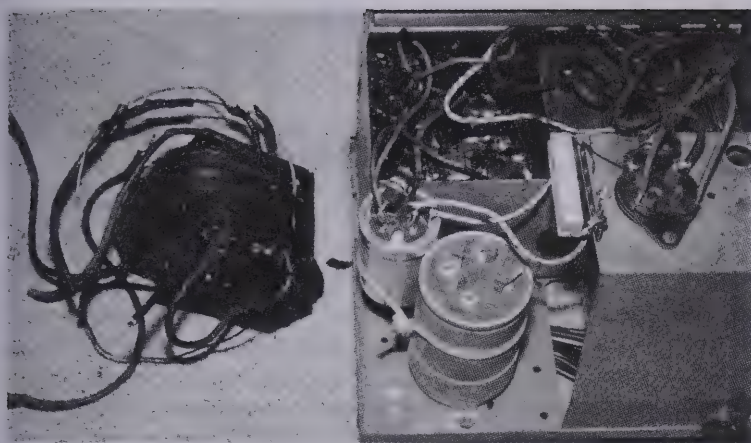
filter choke or speaker field coil, depending on the particular circuit, and that the bias resistors if any are not open.

Line cords are a particular weak point in older sets; they are usually bad, must be examined very carefully, and probably need to be replaced. If you have a resistance line cord of the type that was used in the early AC-DC radios (identified by the fact that it has asbestos heat insulation and contains an extra “third” wire), that is a whole other story that can be discussed in some future column.

Make sure that the power switch is good. If a continuity check shows a high resistance, and it won't clean up, consider replacing it. You may be able to gradually reform the electrolytic filters so that they can take the 250-400 volts that was common in those days. However, and this is important, it is not a good idea to trust these old filters even if you can bring them to life. Most restorers of these sets simply clip them out of the circuit and wire in small, new modern cartridge capacitors under the chassis, out of sight. This is a low-cost safety precaution, and could save a valuable transformer somewhere down the road.



Schematic diagram of the National #697. Note added dropping and bleeder resistors (see text).



Inside of the power supply with replacement parts in place. Burned-out original transformer sits next to it.

This National #697 “doghouse” power supply showed up on my bench recently. Although it is an external power supply, intended for use with the famous HRO communications receiver, its circuitry is similar to that of the built-in supplies you’ll probably be working with. With its signs of considerable abuse and prior work, it is a good example of the problems you might encounter. The black-crackle case was spotted with green paint and the 115/230-volt primary switch was missing. But since they don’t make these “doghouses” any more, it is not a good idea to trash it when it can be restored to operating condition.

In working on a considerable number of these 697s and similar National power supplies over the years, I have yet to find one where the 50-plus-year-old filter capacitors were useable. When it was obvious that the three capacitors couldn’t be restored, the can was disconnected, left in place for historical reasons, and a new can fastened in place with a cable tie. I also routinely put a one- or two-watt 100 K ohm bleeder resistor across the output as a safety measure. Why National never did this is unknown. Reasons of economy?

I next rebuilt the primary circuits by adding a 115/230 V changeover switch and replacing the line cord. I slowly applied power with the rectifier tube out, and quickly established that the AC voltages at the tube plates were substantially unequal. Hating the thought of what might come next, I plugged in the 80 rectifier and again slowly applied primary voltage through the Variac. Sure enough, the transformer, imbedded in tar along with the filter choke, was defective, probably as a result of someone firing it up with aged, defective filters. It would have to be replaced. Now it was obvious why the primary had been disconnected. (Another National economy; no fuse.)

To do this I chipped away the tar overburden and then cut down through the stuff to isolate it from the choke, which appeared to be OK. Then the container was heated (I used a propane torch) until I was able to pull the transformer out of the can. I found that a transformer from a defunct Hammarlund HQ-129X fitted in the hole, and since its filament and high-voltage windings should be able to handle the demands of an HRO, I felt I was in business.

However, the output voltage under load (I plugged in a work-

ing receiver) was over 50 volts too high, and it was necessary to put a 330-ohm 10-watt resistor in series with the filter input. (If you run into this not-uncommon problem, you can determine this value by trial and error, or by a simple calculation using Ohm’s Law. Just be sure that the resistor wattage is adequate to handle the current and voltage drop.) This worked, the output voltage under load was down to the specified 250 volts DC, and the “doghouse” was ready for the finishing touches.

A comment regarding replacement transformers might be in order here, since they are sometimes difficult to find. One source is a “parts” chassis that has a similar number of tubes of the same filament voltage. Another is to search the catalogs from companies such as Antique Electronic Supply. The Internet and its vast resources can also be an invaluable tool.

The replacement transformer was fastened in place with some globs of rubber cement. Then the cabinet was cleaned by picking off the green paint splatters and misting it with a glossy black spray paint. The label was cleaned and given a coat of wax, missing hardware supplied, and the job was done. The only drawback to this particular restoration was that the unit now works only on 115 VAC, as the replacement transformer doesn’t have a dual primary. Since the changeover switch is gone, and the label is altered, hopefully a future owner will realize the situation. (NOTE: I also attached a tag to the line cord summarizing the work done.)

This was an extreme case because as the transformer was not only bad, but it was sealed inside tar, typical of many of the early radio power packs. However, the end result was a restored National power supply. These are becoming rarities, and if the idea of preserving a piece of our technological history doesn’t appeal to you, take a look at the current prices on E-Bay! ☛

NEW BOOKS AND LITERATURE



DAVID W. KRAEUTER, 506 E. WHEELING ST., WASHINGTON, PA 15301 E-MAIL KRAEUTER@SGI.NET

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Books to be reviewed in this column should be sent directly to David Kraeuter at the address above. After review, all such books become a permanent part of The AWA Library, which is part of The AWA Electronic Communication Museum and is available to members for browsing and research.

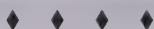
The Invention That Changed the World: How a Small Group of Radar Pioneers Won the Second World War and Launched a Technical Revolution

By Robert Buder. Published 1998 by Simon & Schuster, 212-698-7000, www.simonsays.com. 6 x 9 1/4 inches, 575 pages, softcover, \$16.00.

Many inventions changed the world, but Buder argues convincingly here for radar being the decisive factor in WWII. He goes further and argues that radar's birth in the 30s and frantic development during the War were necessary prerequisites to what he calls "the dramatic, concentrated example of the endless intertwinement of science and technology." He links radar to such post-war advances as the transistor, the maser, nuclear magnetic resonance, tracking of commercial flights, television networks, radio astronomy, particle accelerators, etc. About half the book is devoted to these "children" of radar. (Remember when the microwave oven was called a radar range?)

Buder always attempts to illuminate his subjects through biographical information gathered from interviews with many of the main characters. For example, during the War much of the United State's radar development work was done at MIT's Radiation Laboratory (so named as camouflage). Scientists there soon learned to have a reply ready when they took their ideas and suggestions to their supervisor, Isidor Rabi. Buder tells us that Rabi inevitably wanted to know, "How many Germans will it kill?"

This book is a major popular—i.e., non-technical—history of its subject. It has already become a standard source in its field and is in well over a thousand libraries worldwide.



The Pulse of Radar: The Autobiography of Sir Watson-Watt

By Robert Watson-Watt. Published 1959, out of print, available from www.bookfinder.com. 5 1/2 x

8 inches, 438 pages, hardcover.

This is the shorter version of Watson-Watt's autobiography, contoured for American consumption. It condenses the 480-page British version, *Three Steps to Victory*. Did Watson-Watt invent radar? Yes. He tells us so on page 319. (But see also his contradicting statement on page 11 of the *Journal of the Institute of Electrical Engineers*, volume 93, no. IIIA, 1946). He also takes credit for the "Huff-Duff" or high frequency radio direction finder and names himself as one of the inventors of operational research.

Robert Watson Watt (or Watson-Watt [the hyphen was added when he was knighted in 1942] had to be the Gladstone or Dickens of the radar world, or to put it another way, he was...well...full of himself.

His writing style sometimes is a cross between 17th century Baroque and 19th century Victorian exuberance. Consider the following sentence: "... I have tried to avoid such distortions as are likely to arise when Watson-Watt argues with Watson-Watt about Watson-Watt, and when Watson-Watt reports the debate." Aside from the obvious egoism here, what does this sentence mean? Or this one: "But by the end of 1937 microwave radar seemed like a highly resistive, obstinately non-responsive cavity whose orifice carried an overpublicized negative slogan by Dante." Watson-Watt enjoyed speaking and writing in broad metaphors, this last one probably referring to "Abandon hope all ye who enter here."

If you read only one of these radar histories, which shall it be? If you want objectivity, the inclusion of the British and American sides of radar and what followed it, with lots of information about the major players, read Buder. But if you like your radar history objective, British-oriented and with a large dash of *joie de vivre* thrown in, then you'll want to go with Watson-Watt (or Watson Watt). What?



J. B. Johnson and the 224A CRT

By John B. Johnson. Edited by Ludwell Sibley. Published 2003 as Tube Collectors Association Special Publication No. 5, TCA Inc., P.O. Box 1181, Medford, OR 97501; website www.tubecollectors.org. 5 1/2 x 8 1/2 inches, 32 pages, softcover. Free to anyone joining the Association

KEY AND TELEGRAPH

EDITED BY **JOHN CASALE**, W2NI, 3 PICKERING LANE, TROY, NY 12180
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Western Electric and the Telegraph

This is the first guest article submitted since I took over the Key and Telegraph column. Former Western Electric engineer Bernard Magers gives us an account of the beginnings of telegraph manufacture at Western Electric. I hope it will be the first of many articles by fellow AWA members with special knowledge in this field. And I encourage such members to contact me. The offer especially goes out to those who have historically significant information but have never published it with us before.—jc

It was the telegraph, not the telephone, that provided the beginning of the Western Electric Company. The invention of the electric telegraph by Morse in 1835 quickened the pace of life, changed how the financial markets worked, made communication independent of transportation, and even changed the conduct of warfare. By 1850, the clicking sounder had proven more effective in transmitting information than the cumbersome Morse Register, which printed out the characters. Inventors were challenged on how to transmit more than one signal on a single line and to sustain a signal over long distances.

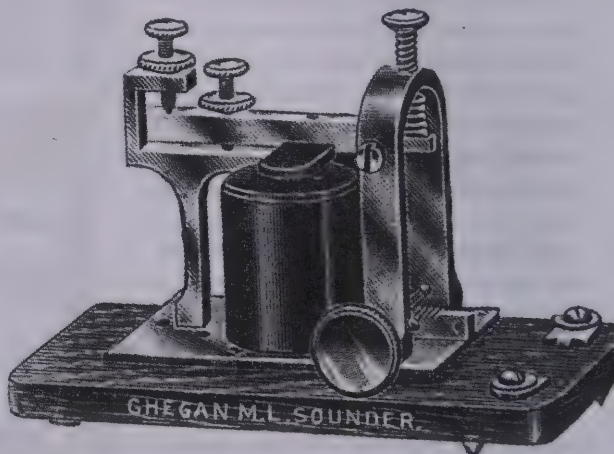
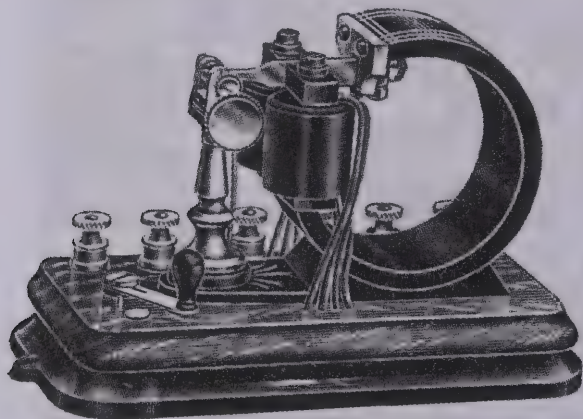
When the government made the decision not to operate a national telegraph network, Western

Union built the first transcontinental line in 1861 and became America's first private communication giant. After the 1866 mergers with American Telegraph Co. and the United States Telegraph Co., 90 per cent of the nation's telegraph lines belonged to Western Union. In 1867, Andrew Carnegie helped organize the Keystone Telegraph Co., a Western Union competitor.

Future Western Union president Anson Stager would become one of the co-founders of Gray and Barton, the nucleus of Western Electric. Earlier, in 1852, Stager was superintendent of the Mississippi Valley Printing Telegraph Co. which later merged with Western Union. By 1861 he was head of the U.S. military telegraph service under General McClellan.

For years the industry wanted to send messages over long distances without signal weakening, and in 1858 George Hicks invented the "automatic repeater," which transferred a weakening signal to a new circuit and battery. In October, 1867, Elisha Gray received a patent for a self-adjusting relay making long distance telegraph even more reliable. In 1869 Gray teamed up with George Shawk in a Western Union shop and Enos Barton joined the partnership.

The April, 1869 edition of the *Journal of the*
(continued on page 64)



Left: W.E. No. 554 differentially-wound, 400-ohm polarized relay. Right: W.E. No. 392 Ghegan 50-ohm main line sounder.

BY **BERNARD MAGERS**, 607 WILLIAM ST, LEES SUMMIT, MO 64081-2623

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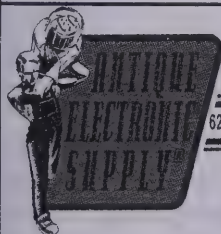
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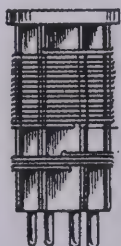
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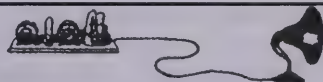


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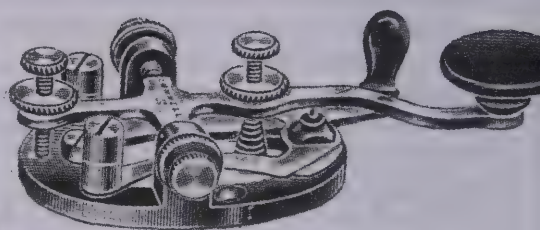
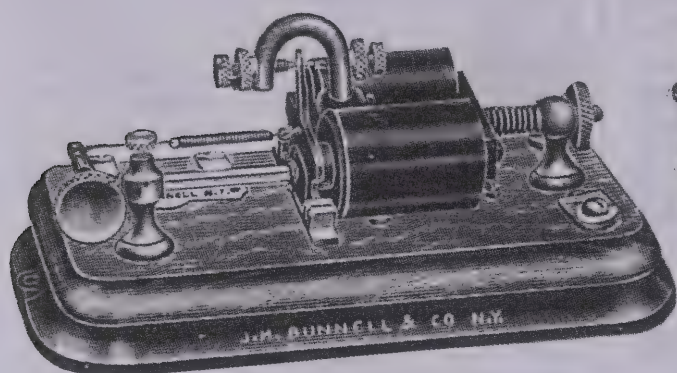
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KEY AND TELEGRAPH, continued from page 62



Left: W.E. No. 536 Bunnell 150-ohm Standard No. 2 main line relay. Right: W.E. No. 9050 legless key ("The Triumph").

Telegraph carried an advertisement for Shawk and Barton that would set the tone for what would become Western Electric's mix of custom work and mass production. They promised to manufacture to order and maintain an inventory of telegraph supplies. In May of 1869, Shawk left this partnership and Gray joined it. Barton's recognition of the value of Gray's inventions, which included the private line printer telegraph, began a tradition of manufacturing innovation that was to characterize the future development of the Western Electric Company.

Gray provided Gray and Barton with technical expertise; Barton contributed administrative knowledge; Stager was a source of capital. In April 1872, Gray and Barton became the Western Electric Manufacturing Company and strengthened its ties with Western Union.

Western Electric was capitalized at \$150,000 with one-third owned by Western Union. Sales averaged \$3000/month with profits of \$500. Three of WE's directors were from Western Union. They were Anson Stager, Statford Lynch, a military telegrapher, and supply manager Thomas Oton. Stager was elected president, Lynch vice president, and Barton secretary/treasurer.

The fall of 1873 brought the Chicago Interstate Industrial Exposition, where Western Elec-

tric's display included the printer telegraph, hotel annunciator, electric fire alarm, and a typewriter. In May of 1874, Gray attempted to transmit sound over telegraph lines on the "harmonic telegraph" and in July he demonstrated an apparatus for transmission of musical tones.

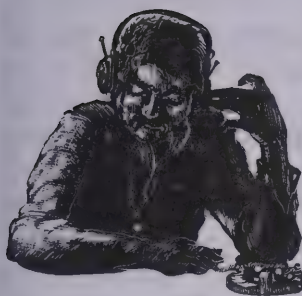
In November 1881, the W. E. Mfg. Co. was reorganized under the state laws of Illinois with a new name, Western Electric Co.

The main Western Electric shop was on Kinzie Street in Chicago and would remain the company's manufacturing center until 1884. W.E. entered the appliance business in the 1880s and eventually became manufacturer and supplier for the Bell System.

The illustrations included with this article are from a catalogue of telegraph equipment stocked at the Hawthorne plant in Chicago around 1910. The catalogue included designs by Western Electric, Bunnell, Atkinson, Smith, Ghegan, Acme, and Barclay. 

REFERENCES:

- Adams and Butler *Manufacturing the Future; A History of Western Electric*, New York, Cambridge Press, 1999.
 Western Electric Telephone Apparatus & Supplies, Catalogue #6, circa 1910.



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Philco Model 40-150 BC/SW pushbutton table radio (1940), FOS pg. 127; GE Model F-70 BC/SW table radio (1938), very similar to F-74 FOS pg. 92, both in excellent working condition, \$100. each plus shipping. Bill Hurni, 329 Evergreen Dr., North Wales, PA 19454 (215) 699-5787 E-mail: wmhurni@att.net

SELL/TRADE—COMMUNICATIONS GEAR

Colonial Radio Corp. radio receiver Model BC-946-B Ser. No. 11854, made in Buffalo, NY. Seven tubes with 10" Jensen speaker, plays good (chassis only). Will trade for decent tombstone, or make offer. Kenneth Miller, 10027 Calvin Street, Pittsburgh, PA 15235 (412) 242-4701

Parting out Kilowatt commercial AM transmitter. Heavy stuff, bargain prices, good condition. Includes three 833 tubes, four mercury vapor rectifiers. Operates on 220 AC. Request parts list & prices. Charles Graham, K2GVE, 4 Fieldwood Drive, Bedford Hills, NY 10507 (914) 666-4523

SELL/TRADE—GENERAL

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Eico Tube & Transistor Testers, Models 666 and 667; Hickok Tube Tester; Sylvania Tube Tester; Military Tube Tester TV-7; Eico VTVMs Models 249, 232; Eico Model 324 RF Signal Generator; Eico AF Signal Generator; Heathkit Oscilloscope; Bearcat scanners; Dumont AC voltage calibrator for oscilloscope; Knight Kit Signal Tracer; Lafayette 5 watt CB Walkie-Talkie, with tech. manual; WWII BC 348A receiver; WWII BC221 Frequency meter; Eico Model 950 RCL Bridge. Alan Mark, P.O. Box 372, Pembroke, MA 02359

Coronado B3 battery, \$45.; Emerson CS 268, no back, \$45.; Firestone 4-A-168, top crack, \$25.; Fujiya 5" reel to reel, \$25.; GE 321, \$55.; GE 115W, \$50.; Grunow 580, \$175. All working and clean, shipping extra. Robert Rossi, 10936 Melbourne St., Allen Park, MI 48101 (313) 386-8321

RCA headphone, 1920s, coils good, cord open., \$18.; WE 396A telephone operator's horn shape speaker, with breast plate, no cord, 1920s, \$50.; watch case type phone, coils good, cord open, manuf. by Solid, Patent date 8-14-1900, \$15.; escutcheon plate for an AK 84 or 558 cathedral radio dial plate with 3 dial knobs, \$15.; cookie jar in shape of Atwater Kent 84, 10 inches high, cobalt blue, in excellent condition, \$50. Herman Fothe, 5292 Tiffany Ann, West Palm Beach, FL 33417 (561) 688-2794

Power supplies, 24 volt, 10A DC, \$25. ea.; BC 221 Frequency Meter with AC power supply and manual, \$60.; Robert Martin, 111 Bancroft Dr., Rochester, NY 14616 (585) 663-4182

93-year collection (includes my dad's) of radios, ham radio, electrical, optical, photographic, H.V.A.C., automotive, watches, timers, clocks, computers, calculators, sound amplifiers, PA and broadcast, speakers, (columns), horns (1930s-1965), sirens, cabinets, panels, aluminum boxes, chassis, meters, antennas, flashlights, batteries, chargers, dynamotors, variacs, transistor radios, books, manuals, circuits, catalogs, handbooks, military radar collection, Radio Masters, ARRL Callbooks, Allied, Cameradio, etc. Francis Yonker, P.E., W2IBH, 1229 Inverary Place, State College, PA 16801-6454 E-mail: yonker1229@adelphia.net

SELL/TRADE—LITERATURE

1930 Baird stock certificate, \$100. ea; 1913 Marconi stock certificate, \$65. ea., 1960 Collins Radio stock certificate, \$20. SASE for list. J.J. Papovich, 165 Trellis Lane, Sewell, NJ 08080 (856) 464-6741

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Axial- and radial-lead film electrolytic capacitors for vintage tube radios. For price list and product info, please contact Dave Cantelon, 42 Clematis Rd., North York, Ontario, Canada, M2J 4X2 (416) 502-9128 E-mail: justradios@yahoo.com or visit our Web site www.justradios.com

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Buying restorable 7 inch 1940s TV sets, and 7JP4 picture tubes. Thanks. Charles Harper, 2000 Jackstown Road, Paris, KY 40361 (859) 484-9393 E-mail: charper@kyk.net

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WANTED—INFORMATION

Please help, my frequency meter has failed, the manufacturer is no longer in business. I need a manual or at least a schematic for a Data Precision, Model 5740. Thanks! Chuck Davis, 7666 Aldridge Place, Dublin, OH 43017 E-mail: cdavis@columbus.rr.com

WANTED—PARTS

Atwater Kent Type 11 Tuner faceplate and knob to complete restoration of AK 4052 breadboard receiver (will consider a complete tuner). Have deForest 3 coil tuner with a set of coils and a Grebe filament rheostat from an RORK for trade. Bill Hurni, 329 Evergreen Dr., North Wales, PA 19454 (215) 699-5787 E-mail: wmhurni@att.net

WANTED—TUBE RADIOS

Attempting to restore a 1948 Majestic console,

which has a chassis from either an 8FM775 or 8FM776 model. It is a family radio containing old, but good, memories. However, rust and mice got there before me. Just need the electronics (chassis, speaker, antenna and record player), in restorable condition. Will meet any reasonable price. Cliff Huff, 2215 Ridgewood St., Carrollton, TX 75006

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WANTED—TUBES/TRANSISTORS

DeForest 420-A receiving tube. Dud filament acceptable. John H. Walker, Jr., 13406 W. 128th Terr., Overlook, KS 66213 (913) 782-6645 E-mail: jhwalker@prodigy.net

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LARRY BABCOCK

Report on Niagaradio 2002

Larry Babcock grew up in his dad's radio sales and service business, acting as a service tech while still in high school. After serving in the Infantry during World War II, he earned a BSEE degree at the University of Iowa and began a 37-year career at Bell Aircraft. At Bell, Larry headed programs to develop radar and air-to-air microwave relay links for the RACAL missile system and, later, to evaluate the army's military electromagnetic interference problems. During his last years at Bell, Larry was in charge of the design of electromagnetic compatibility (EMC), TEMPEST, ordnance safety, radiation hazards and lightning immunity for all military equipment produced by the company. Later he worked in these same fields as a consultant for other companies.

Larry began collecting antique radios in about 1973. He specializes in federal, Wurlitzer, and WWI aircraft sets, and has written a book on the history of Federal Radio. He is on the board of directors of AWA, Inc. and serves as a guide at the AWA Museum in Bloomfield, NY.



MIKE KATZDORN

Armstrong and the Birth of FM Broadcasting

Mike has been a collector since his high school days in the late 60s and an AWA member since the late 70s. Besides his interest in Armstrong, he also enjoys collecting early radio documentation, early vacuum tubes and interesting equipment. Mike is General Manager of an electronics manufacturing company near D.C. and a Fellow of the Radio Club of America.



DAVID W. KRAEUTER

Radio Manufacturers of the 1920s: A Crossword Puzzle

David Kraeuter was born in Homestead, PA

in 1941. He holds an M.L.S. degree from the University of Pittsburgh. He has edited the Pittsburgh Oscillator and the monograph series of the Pittsburgh Antique Radio Society. Currently, David writes the book review column for *The OTB*. Since the 1980s he has been interested in making the vast wealth of information buried in national patent publications more accessible to the public. He thinks he has made a beginning in this work with his latest book, *Radio Patent Lists and Index, 1830-1980*, published by the Edwin Mellen Press. In 620 pages, the book tabulates and indexes 6,200 U.S. and British patents issued to 100 radio and television inventors. David is also working with radar pioneer and writer G. W. A. Dummer of the UK on the 5th edition of *Electronic Inventions and Discoveries*, a chronology of electronic firsts from the 17th century to today.



BERNARD MAGERS

Western Electric and the Telegraph (in "Key and Telegraph")

A retired production engineer for Western Electric, Bernard Magers worked for 38 years in the vacuum tube manufacturing industry. Mr. Magers is the author of *75 Years of Western Electric Tube Manufacturing* and holds a patent in tube construction. He attended the University of Minnesota, served in the Navy during World War II, and is a licensed pilot.



KEN OWENS

Substitutes for the WD-11

Ken first became interested in electronics and radio as a high-school student during World War II. By the end of hostilities, he and a friend were operating a thriving radio repair shop. Ken's career as a full-time radio tech ended when he entered college, eventually earning
(continued on page 69)

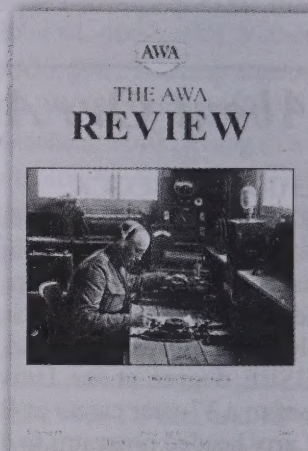
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The AWA Review acts as a showcase for some of the excellent research done by AWA members. This volume represents an attempt to link the articles in the Review more closely with the papers and exhibits at the annual AWA Conference in Rochester, NY. Three of the four articles are based on papers or exhibits at past conferences. The fourth article, although not based on a conference presentation, is particularly timely since it reports on the Marconi Wireless Apparatus on the Titanic as revealed and confirmed by the latest photographs of the radio rooms on the wreck.

The articles cover (1) the role that wireless interception has played intelligence gathering from the first days of wireless communication to the present (by Bart Lee), (2) the exact configuration of the Marconi wireless apparatus as confirmed by recent underwater photographs (by Parks Stephenson), (3) the Radio and Seed Business of Henry Field and a discussion of other early broadcasters who were both radio pioneers and radio entrepreneurs (by George A. Freeman), (4) the history of the Rogers Radio Company and their early AC Tubes (by Maurice Chaplin). A "Cumulative Table of Contents" included at the end of this volume lists the title of every article in every volume of *The AWA Review* since it began publication in 1986. Price: \$24.95 US postpaid in US and Canada; elsewhere, add \$5.00.



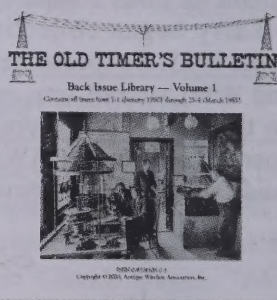
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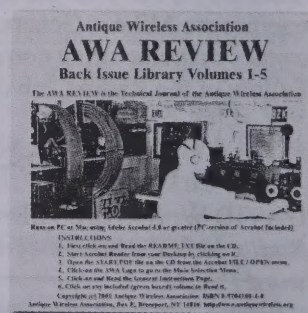
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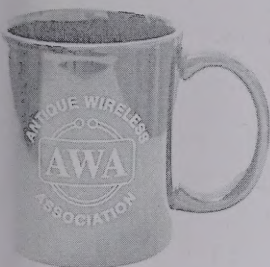
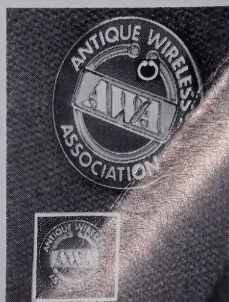
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ABOUT OUR AUTHORS, continued from page 67

both a B.S. and an M.S. in chemistry. Ken pioneered in the development of Mylar, working with manufacturers using the material in such applications as capacitors, videotapes and audiotapes. He became a serious radio collector in the 1980s, a few years after his retirement, and specializes in 1920s broadcast sets. Ken is active in the Central Ohio Antique Radio Association and frequently gives presentations in radio theory and radio history.



WILLIAM N. PARKER
Early Chicago Television

No biographical information available for the author of this reprinted vintage article.

RONALD R. THOMAS, W8QYR

Licensed Commercial Radio Operators: The Forgotten Men of Radio

Ronald Thomas is a communications specialist who has written over 100 articles and two books on telecommunications. He holds an Extra Class Amateur Radio License, a Second Class Commercial Radiotelegraph License and a First Class Commercial Radiotelephone License. He served as a Communications Electronics Officer, with rank of Captain, in the U.S. Air Force at Cape Canaveral. He received a Bachelor's degree, with honors, from Youngstown University and a diploma in Advanced Communications Engineering from the Cleveland Institute of Electronics.

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